Westinghouse

ENVIRONMENTAL REPORT FOR HEMATITE SITE DECOMMISSIONING

DOCUMENT No.: DO-05-001, Rev. 0

NRC License SNM-33, Docket No. 70-36

HEMATITE, MISSOURI

August 2005

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ABBREVIATIONS AND ACRONYMS

ABB	Asea Brown Boveri
ACM	asbestos-containing material
ALARA	as low as reasonably achievable
Am-241	americium-241
AQCR	Air Quality Control Region
ARAR	Applicable or Relevant and Appropriate Requirement
CE	Combustion Engineering
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DP	Decommissioning Plan
DCGL	derived concentration guideline level
DOT	Department of Transportation
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
FEMA	Federal Emergency Management Agency
GPM	gallons per minute
HAER	Historic American Engineering Record
HEPA	high-efficiency particulate air
HSU	hydrostratigraphic unit
IDW	Investigation Derived Waste
KPA	kinetic phosphorescence analyzer
LDR	Land Disposal Restriction
LLRW	low-level radioactive waste
μCi/ml	microcuries per milliliter
MDNR	Missouri Department of Natural Resources
mrem	millirem
MoDOT	Missouri Department of Transportation
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
Np-237	neptunium-237
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NUREG	Nuclear Regulation
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PCE	perchloroethylene
Pu-239	plutonium-239
RACE	Radiological Assistance Consulting and Engineering
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation

RI/FS	Remedial Investigation/Feasibility Study
SAA	site accumulation area
SAIC	Science Applications International Corporation
SNM	special nuclear material
Tc-99	technetium-99
Th-232	thorium-232
TSS	total suspended solids
TSCA	Toxic Substances Control Act
TSDF	Treatment Storage and Disposal Facility
TCE	trichloroethylene
U-234	uranium-234
U-235	uranium-235
U-238	uranium-238
UF_6	uranium hexafluoride
USDA	U.S. Department of Agriculture
VOC	volatile organic compound
WAC	waste acceptance criteria

1.0 INTRODUCTION

Westinghouse Electric Company LLC (Westinghouse) is proposing to decommission the Hematite Former Fuel Cycle Facility (Hematite). The site-wide *Hematite Decommissioning Plan* (DP) (Ref. 1) and key supporting documents have been submitted to the U.S. Nuclear Regulatory Commission (NRC). Westinghouse plans to decommission the Hematite site in a manner that is consistent with the DP, the site NRC license (Ref. 2), NRC regulations, and the goals and objectives established through the National Contingency Plan (NCP), 40 CFR 300 (Ref. 3). As part of the DP approval process, the NRC requires the licensee to prepare an Environmental Report (ER) to describe the potential impacts that could result from implementation of the DP. This ER was prepared in accordance with NUREG 1748 (Ref. 4) and addresses the requirements of the National Environmental Policy Act (NEPA) (Ref. 5) and applicable NRC regulations, specifically 10 CFR 51.45 (Ref. 6).

The Hematite facility is located approximately ¾ of a mile northeast of the unincorporated town of Hematite (38:12:07N and 90:28:51W) and approximately 35 miles south of the City of St. Louis, Missouri. The entire site covers an area of approximately 228 acres, but licensed activities were restricted to process buildings and grounds within an approximately 10-acre central site tract. The site land outside the central site tract, i.e., outlying land areas, has no known history of licensed activities. Land areas near the site are primarily forest, agricultural, and suburban/residential.

Throughout its history, Hematite's primary function has been to manufacture uranium metal and uranium compounds from natural and enriched uranium for use as nuclear fuel. Beginning in 1956 and continuing to the mid-1970s, the plant produced uranium compounds for use in the U.S. Navy nuclear program and for use by the U.S. Department of Energy. Subsequently, the plant continued to produce nuclear fuel, but for commercial use. Westinghouse acquired the site in April 2000 and closed the facility in June 2001. Current operations are focused on various cleanup and decommissioning tasks, which have been approved under the site's NRC license.

1.1 Purpose and Need for the Proposed Action

Westinghouse has ceased fuel production operations at the site and has no future plans for operation of the site as a nuclear fuel processing facility. Based upon site characterization studies and historical information, more than 45 years of processing nuclear material have resulted in chemical and radiological contamination in soil, surface water, groundwater, and process buildings in the central site tract where licensed activities were conducted. The purpose and need for the proposed action is to reduce the risk to the public, site workers, and the environment posed by the existence and potential release of hazardous substances at the Hematite site.

1.2 The Proposed Action

The proposed action by the site licensee, Westinghouse Electric Company, is remediation and final status survey of the Hematite site as necessary to meet the radiological release criteria established in the DP. Characterization and remediation of soil and other impacted media and material would be performed consistent with approved DCGLs (derived concentration guideline levels). Through implementation of this proposed action, the ultimate goal is termination of NRC License No. SNM-33.

Regional area maps showing the location of the site and nearby towns are provided in Figures 1-1 and 1-2. Figures 1-3 and 1-4 show the site and facility layouts, respectively and other site and facility features that will be discussed throughout this report.

The projected schedule for the proposed action, Figure 1-5, identifies major decommissioning milestones and tasks. The start date of the schedule is contingent upon NRC approval of the DP and satisfaction of requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The proposed action, with the exception of any required groundwater treatment, is projected to be completed approximately five years after the start date.

Figure 1-1 General Location of the Hematite Site

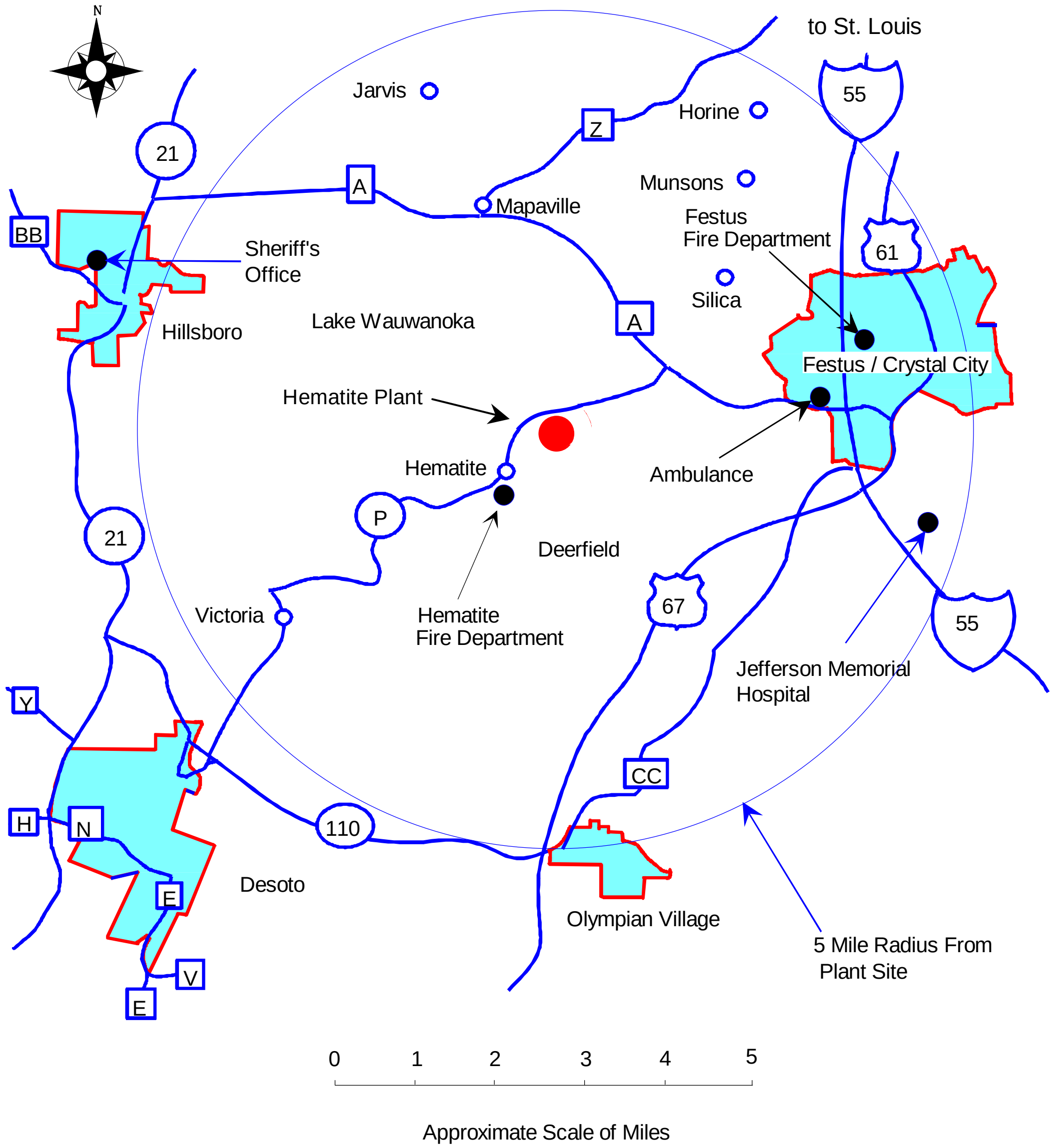

Figure 1-2 Area Within 5-Mile Radius of the Hematite Site

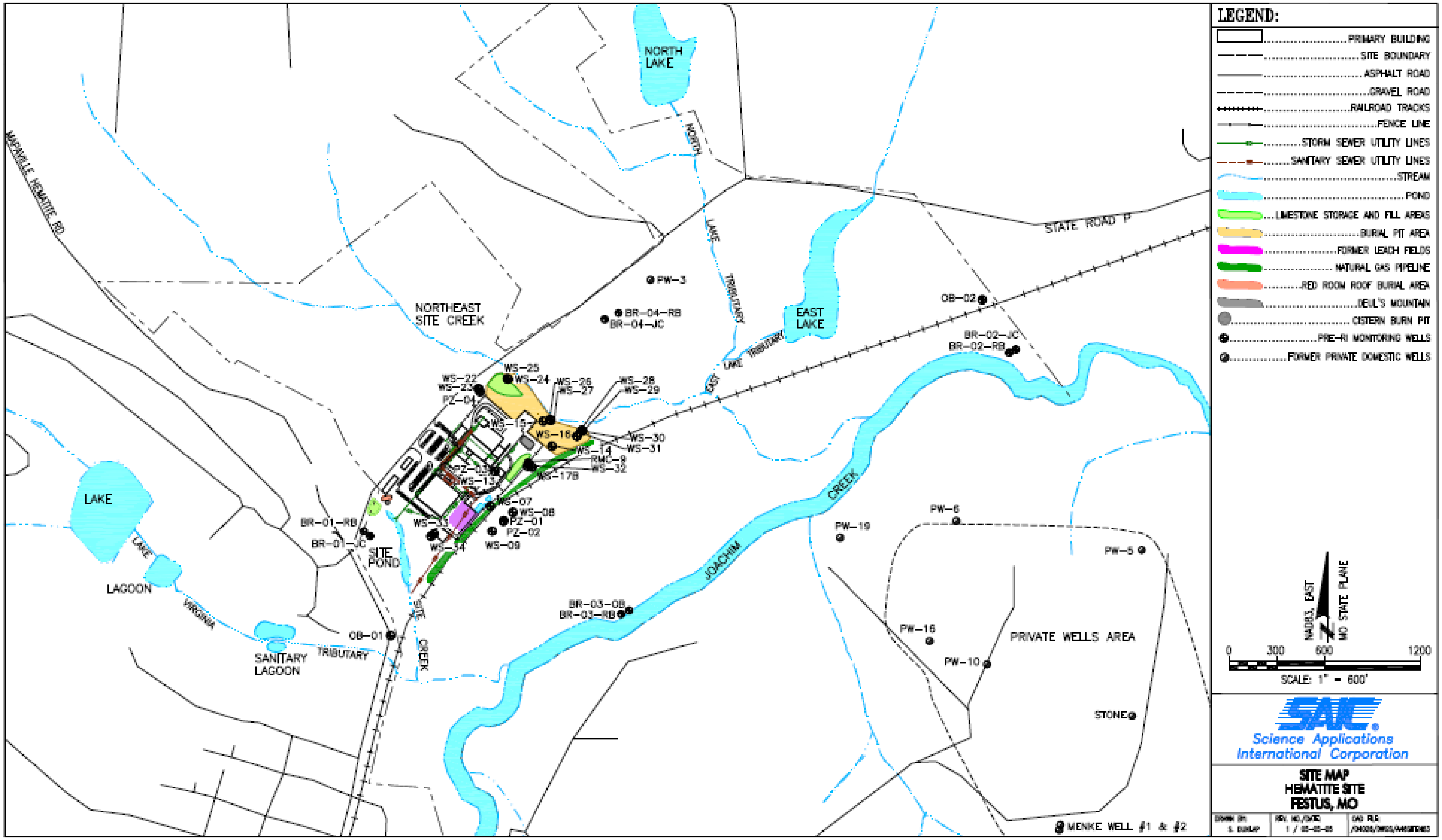

Figure 1-3 Site Map

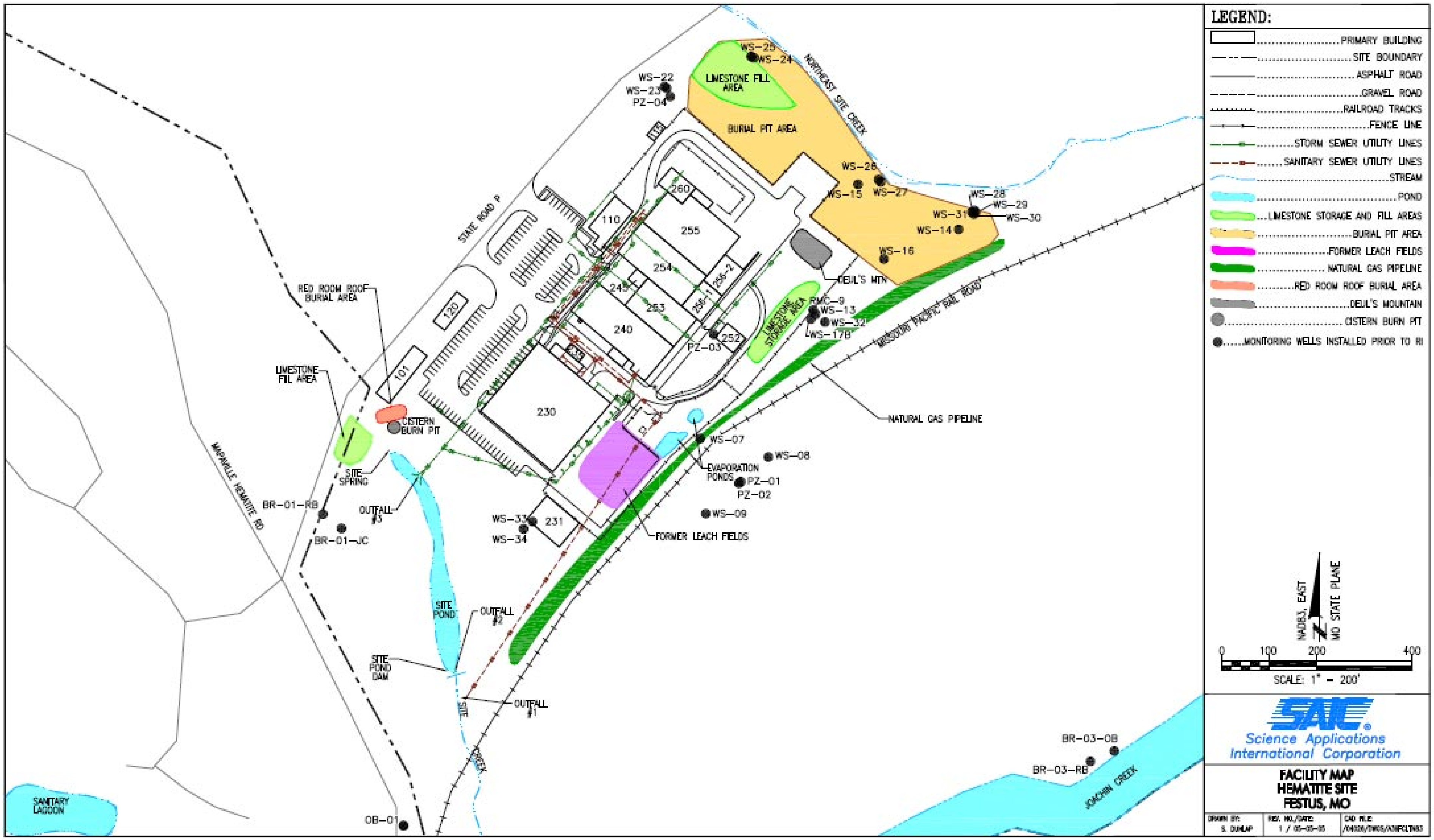

Figure 1-4 Facility Map

ID	Task Name	Duration
1	NRC Approval of DP	0 months
2	**Outlying Land Areas**	**8 months**
3	Survey Outlying Land Areas	6 months
4	Prepare Outlying Land FSSR	6 months
5	Outlying Land FSSR to NRC	0 months
6	**Soil (Central Site Tract)**	**49 months**
7	Burial Treatability Study/Planning	24 months
8	Remediate Burial Pits	12 months
9	Prepare Burial Pit FSSR	12 months
10	Burial Pit FSSR to NRC	0 months
11	Remove Slabs/Foundations	6 months
12	Remediate Soil	8 months
13	Prepare Soil FSSR	8 months
14	Soil FSSR to NRC	0 months
15	Waste Management	24 months
16	Backfill Excavations	18 months
17	Final Restoration	2 months
18	**Surface Water**	**15 months**
19	EPA/State/Local Approvals	6 months
20	Divert Stream	3 months
21	Remediate Stream Bed	4 months
22	Prepare Stream FSSR	4 months
23	Stream FSSR to NRC	0 months
24	Waste Management	5 months
25	Final Restoration	1 month
26	**Remaining Buildings**	**14 months**
27	Decision on Leaving Buildings	0 months
28	Develop Supporting Documents	6 months
29	Remediate/Survey Buildings	6 months
30	Prepare Building FSSR	6 months
31	Building FSSR to NRC	0 months
32	**Groundwater**	**21 months**
33	Groundwater Monitoring	18 months
34	Groundwater Treatment Plan Review	3 months
35	Decision on Groundwater Treatment	0 months

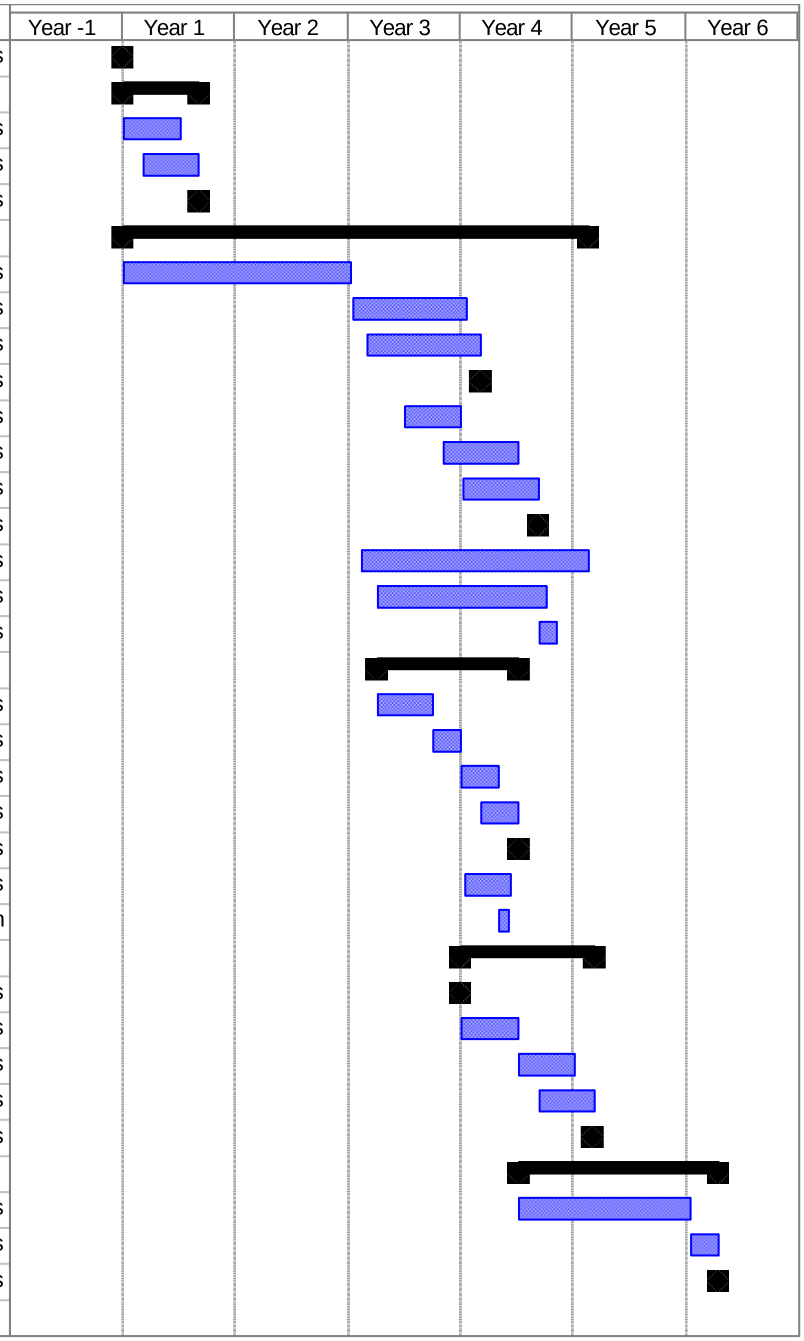

Figure 1-5 Proposed Action Schedule

1.3 Applicable Regulatory Requirements, Permits, and Required Consultations

The DP has been submitted to the NRC for approval and incorporation into NRC License No. SNM-33. The proposed action described in this ER would be performed in accordance with the approved DP to allow license termination in accordance with the requirements of the License Termination Rule at 10 CFR 20, Subpart E.

Westinghouse has entered into a Consent Decree with the state of Missouri for the conduct of site investigations and remedial planning in accordance with the NCP and CERCLA. Westinghouse intends to proceed through the NCP process, formulating, designing, and implementing remedial actions at the site where determined necessary to satisfy human health and ecological risk reduction objectives under the NCP. Similarly, as specified in the NCP, Westinghouse intends to conduct these remedial actions in compliance with federal and state environmental, health, and safety regulations that constitute applicable or relevant and appropriate requirements (ARARs).

2.0 ALTERNATIVES

2.1 Detailed Description of the Alternatives

The alternatives addressed in this ER are based on the assumption that building demolition will be approved under NRC License No. SNM-33 to remove above-grade structures as a source of contamination and as an interference to soil characterization and potential soil and groundwater remediation underneath the structures. The proposed building demolition is addressed in another ER (Ref. 8), which has been submitted to the NRC.

2.1.1 No-Action Alternative

The no-action alternative would require perpetual care and security for the facility in its current radiological condition. This would involve continuing administrative controls (e.g., monitoring and surveillance) and engineering controls (e.g., access control and maintenance of security fencing and warning signs) as required by state and federal regulatory agencies.

The major impacts of this no-action alternative include:

- Risk of potential public exposure to radiological and chemical contaminants at the site is not reduced or eliminated. Although engineering and administrative controls would assist in limiting exposure to the contaminants at the site, uncontrolled releases or exposures could still occur. The contamination source would remain in place with the potential to spread into surrounding soils and water pathways, increasing the potential for public exposure.
- Risk of environmental contamination is not changed. The potential for spreading contamination from soils and groundwater into the surrounding environment would continue to exist.
- Options for future property use would be significantly limited.

2.1.2 Proposed Action

As indicated in Section 1.2, the proposed action by Westinghouse is remediation and final status survey as necessary to meet the release criteria established in the DP for soil, surface water, groundwater, and any buildings that are left in place on the Hematite site. Specific activities required by the proposed action include:

- Final status survey of site outlying land areas to confirm that these areas meet the release criteria in the DP. The central site tract and outlying land areas are shown in Figures 1-3, 1-4, and 3-4.
- Remediation of waste Burial Pits within the central site tract consistent with operational DCGLs and the NCP process (following additional treatability/characterization studies)

- Removal of pavement, concrete slabs, foundations, and below-grade utilities left from the demolition of above-grade structures in the central site tract (Westinghouse has applied for a license amendment from the NRC that would allow demolition of all above-grade structures on the site.)
- Remediation of contaminated soil consistent with operational DCGLs and the NCP process
- Remediation, as necessary, of surface water bodies and associated sediments adjacent to the central site tract and remediation of groundwater, as determined by the characterization results and the NCP process.
- Remediation, as necessary, of any facility buildings that are left in place (Certain buildings at the site have no evidence of radioactive contamination or contain low levels of contamination. If it is determined that selected buildings can remain, decontamination, as necessary, and a final status survey would be performed.)
- Transportation of waste to an authorized disposal facility.
- Final status surveys in the central site tract and adjacent stream sediments to confirm that the release criteria in the DP have been met.
- Central site tract restoration.

More detailed information on the decommissioning scope and activities can be found in the DP.

Impacts due to site decommissioning activities are expected to be temporary in nature and minor in scope. The following impacts could result from decommissioning work:

- Transportation—There would be increased truck traffic on local highways for the transport of waste generated by the decommissioning activities. There would also be some increase in traffic due to addition workers commuting to the site. Because of the site location, this increased traffic is not expected to result in any significant inconvenience to local communities or businesses.
- Air quality—Dust would be generated during soil excavation and backfill and during demolition of concrete pads left from building removal. Dust control would be effected by spraying the work areas with water to minimize airborne dust and potential contamination. If necessary during concrete slab removal, foaming agents could also be applied to minimize the generation of airborne dust and potential contamination. In localized areas of particular concern, a containment tent could be constructed over contaminated areas with HEPA (high-efficiency particulate air) filtration to control airborne releases.
- Noise—There would be periods of increased construction noise during decommissioning. Heavy machinery, jackhammers, air compressors, and other equipment would be used. Because of the site location, this periodic noise is not expected to be intrusive to the local communities.

2.1.3 Reasonable Alternatives

Based upon the licensee's decision to close the site and terminate the present NRC licensee, no alternatives to the proposed action are being considered.

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Hematite site is situated south of State Road P, between hills to the northwest and the Joachim Creek floodplain to the southeast. The following sections focus on the baseline conditions (the status quo) of the site and surrounding land areas. The baseline conditions are used to assess the impacts associated with implementation of the proposed action as discussed in Section 4.0.

3.1 Land Use

The primary land use within a five-mile radius of the facility consists of deciduous forest, pasture, and urban/residential. Residential land use is concentrated in the communities of Festus/Crystal City to the northeast, Horine to the north, and Hillsboro to the northwest. Land use classifications are based on the National Land Cover Dataset as shown in Figure 3-1.

Interstate 55 is a major transportation corridor located three miles east of the site and provides access to the site via State Roads A and P. The Union Pacific railroad crosses the property from the southwest to the northeast.

The nearest significant public land is the Victoria Glades Conservation Area located approximately 3.5 miles west of the Hematite site. No other significant public lands are located within a five-mile radius of the site.

The primary natural resources occurring at or near the site are agricultural lands, surface water ponds and streams, and groundwater. There are some wooded areas on and surrounding the site, but the low quality of the timber makes any major harvesting unlikely.

The surface water features on and near the site include a permanent flowing stream, a spring, intermittent perennial and ephemeral streams, a lake, and ponds. These surface water features are not used for drinking water, but some are used for watering livestock. Groundwater is widely used as the primary source of household water.

There are 33 surface mines within 5 miles of the Hematite site. The closest are two limestone quarries, less than two acres in size, that are approximately 1 mile southwest of the site. The other mines consist of 1 copper, 11 lead, 2 other limestone, and 17 sandstone quarries. Most of these lie outside of a 2-mile radius from the site.

It is anticipated that future uses of the land in and around the site will remain roughly consistent with its current use. In November 2001, as part of a more formal Community Relations Plan for the Hematite site, a series of interviews was conducted with residential neighbors, adjoining property owners, and other community leaders and officials to determine the interests and concerns of the community. The issue of future land use and development opportunities for the site was discussed, and the community of Hematite expressed significant interest in future development of the site. As of June 2005, no definite future plans have been developed for the site.

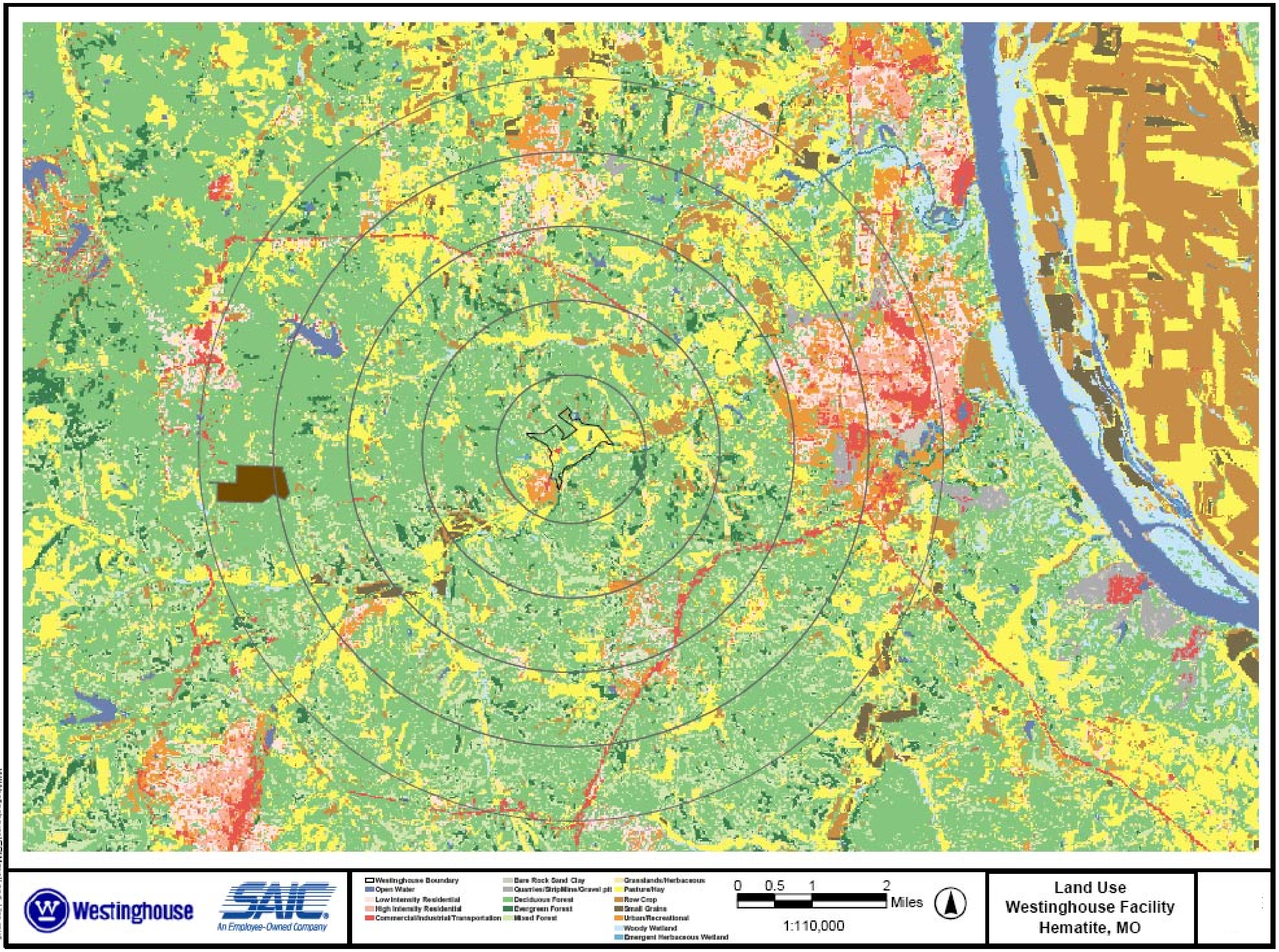

Figure 3-1 Land Use Classifications

3.2 Transportation

3.2.1 Transportation Corridors

The Hematite site is served by a network of roads, including an interstate freeway, state highways, and state routes. The entrance to the site is on State Road P, a two-lane rural highway that runs through the site. The annual average daily traffic count for State Road P in 2002 was 2,570 vehicles per day (Ref. 9). State Road A, a two-lane rural/suburban highway, connects to State Road P approximately two miles east of the site. Although traffic on these roads is typical of low-volume rural highways, weekend and “rush-hour” traffic volume increases do occur. State Road A enters the western edge of the City of Festus, Missouri, and traffic counts increase with proximity to this city. Interstate Highway 55 (I-55), a major north-south freeway, is located approximately 3.5 miles east of the site and intersects with State Road A in Festus, Missouri. This four-lane interstate freeway extends from La Place, Louisiana to Chicago, Illinois and connects to Interstate Highways 270, 44, and 70 in the St. Louis, Missouri area, approximately 35 miles north of the site. In 2002, the annual average daily traffic count for I-55 near Festus, Missouri was 35,347 vehicles per day (Ref. 9). The vicinity transportation networks are shown in Figure 3-2. Public transit systems, such as bus or light rail, are not available in the immediate vicinity of the site.

The Hematite site is located within the St. Louis District (District 6) of the Missouri Department of Transportation (MoDOT). MoDOT currently does not have plans to improve the section of State Road P that extends from the facility to State Road A or the section of State Road A from its intersection with State Road P to I-55. Between 2005 and 2007, some bridge rehabilitation work is planned for structures along State Road A (Ref. 10).

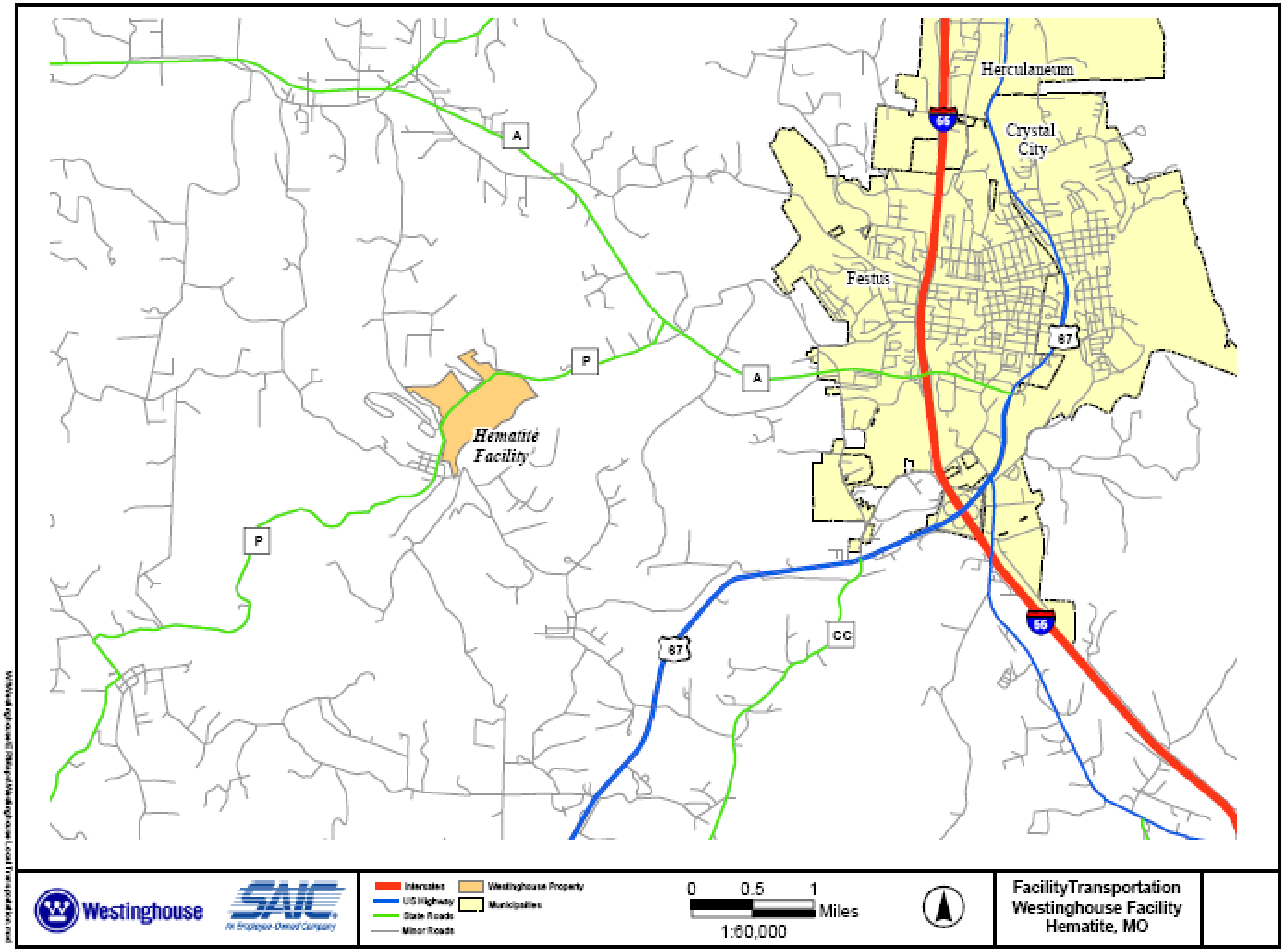

Figure 3-2 Vicinity Transportation Networks

3.2.2 Waste Transportation

Most of the waste generated by the proposed action is expected to be transported by truck and/or rail to the Envirocare facility in Clive, Utah. Waste not suitable for Envirocare would be transported to another approved processing or disposal facility.

Other disposal alternatives could be developed and implemented based upon technical feasibility, regulatory requirements, and cost-effectiveness. Carriers might deviate from the following general routes because of road construction, detours, weather conditions, or other reasons. Carriers would be required to hold appropriate state permits for the transportation and hauling of radioactive/hazardous materials.

The Envirocare facility is located in the Great Basin Desert area of western Utah, approximately 75 miles west of Salt Lake City. Trucks traveling to the Envirocare facility would use designated routes limited to Interstate Highways 15, 215, 80, and 84 and the short Tooele County road from Interstate 80 to the Envirocare facility. It is anticipated that trucks bound for the Envirocare facility would exit the Hematite site and proceed along the following general route of approximately 1,430 miles:

- East on State Road P toward State Road A
- East on State Road A toward Festus
- North on I-55 toward St. Louis
- North on I-270 toward Kansas City
- West on US-40 toward Wentzville
- West on I-70 to Kansas City
- North on I-435 toward Des Moines
- North on I-29 toward St. Joseph
- West on IA-2 toward Nebraska City
- West on I-80 to Salt Lake City
- I-80 west to Clive, Utah (Envirocare facility)

Material to be shipped to Envirocare by rail would first be transported by truck to the rail yard designated by the receiving railroad.

3.3 Geology and Soils

The Hematite Site is located within the Salem Plateau section of the Ozarks Plateaus Physiographic Province. The site region is underlain by flat-lying to gentle northeasterly dipping Cambrian to Lower Ordovician strata that are mostly dolomitic. The Paleozoic rocks are overlain by unconsolidated surficial deposits of Tertiary to Quaternary age.

Based upon the "Missouri Geologic Map," 1979 (Ref. 11) and the "Bedrock Geologic Map of the Festus 7.5 Minute Quadrangle, Jefferson County, Missouri" (Ref. 12), the uppermost bedrock beneath the site is the Ordovician-age, Jefferson City Dolomite.

The Jefferson City Dolomite is described as mostly light-brown to medium-brown, medium to finely crystalline dolomite and argillaceous dolomite. The Jefferson City Dolomite is typically 125 to 325 feet thick and is bounded above by the Cotter Formation, also mostly a dolomite, and below by the Roubidoux Formation, predominately a sandy dolomite with lesser beds of dolomitic sandstone and dolomite (Ref. 13).

The Festus quadrangle geologic map (Ref. 12) shows Quaternary (Holocene) alluvium and terrace deposits to be closely associated with Joachim Creek and its tributaries in the vicinity of Joachim Creek. Holocene alluvium is described as clay, silt, sand, and gravel chiefly derived from local loess and colluvium. Colluvium is described as a mixture of residuum, from fines to cobbles, and loess that is moving down slope as a result of slope wash and gravity. Colluvium accumulates at the base of valley slopes and, in large valleys, washes onto the floodplain, blending with the alluvium. Terraces typically contain lenticular beds of sand and gravel interbedded with silt and clay.

The overall thickness of alluvium/terrace deposits underlying the Joachim Creek valley near the facility varies from 20 to 35 ft and is comprised primarily of upper fine-grain silts and clay that overlie coarser-grain material (sands-gravels) near the bedrock surface. The thickness of the coarse-grain units is highly variable in this region and ranges from 0 to greater than 20 ft. The soil profile shows upper alluvial soils of stiff, very silty clays containing some sand, underlain by silty clays of firm to stiff consistency to depths of 10 to 13.5 feet. Very stiff, highly plastic clay with limestone fragments were next encountered to depths of approximately 22 feet. Firm to stiff, sandy, silty clay was then found until auger refusal was obtained on boulders or limestone bedrock at an approximate depth of 36 feet. The overburden consists of quaternary alluvial and colluvial deposits of silts, clays, sands, gravels and cobbles. Overburden depths vary across the site from 8.5 to 45 feet below ground surface, being deeper near Joachim Creek and shallower towards State Road P (Ref. 14).

Regarding seismology, although there are no mapped or suspected faults within several miles of the site (Figure 3-3), the southeastern area of Missouri is quite active seismically (Ref. 15). The southeastern part of Missouri contains a portion of the New Madrid Fault that caused the "great earthquakes" of 1811 and 1812. There were three quakes of Epicentral Intensity XII Modified Mercalli scale (M.M.) that took place on December 6, 1811 and January 23 and February 7, 1812 near New Madrid. In 1962, a quake measuring V (M.M.) was recorded in the New Madrid area. A quake with a magnitude of 4.5 was recorded in the New Madrid area in 1963. A quake reported as "the strongest in years" occurred near Caruthersville, Missouri, 150 miles southeast of Hematite, on

December 3, 1980. The closest earthquake to the Hematite site of 3.0 magnitude or greater was centered roughly 10 miles south-southeast of the facility.

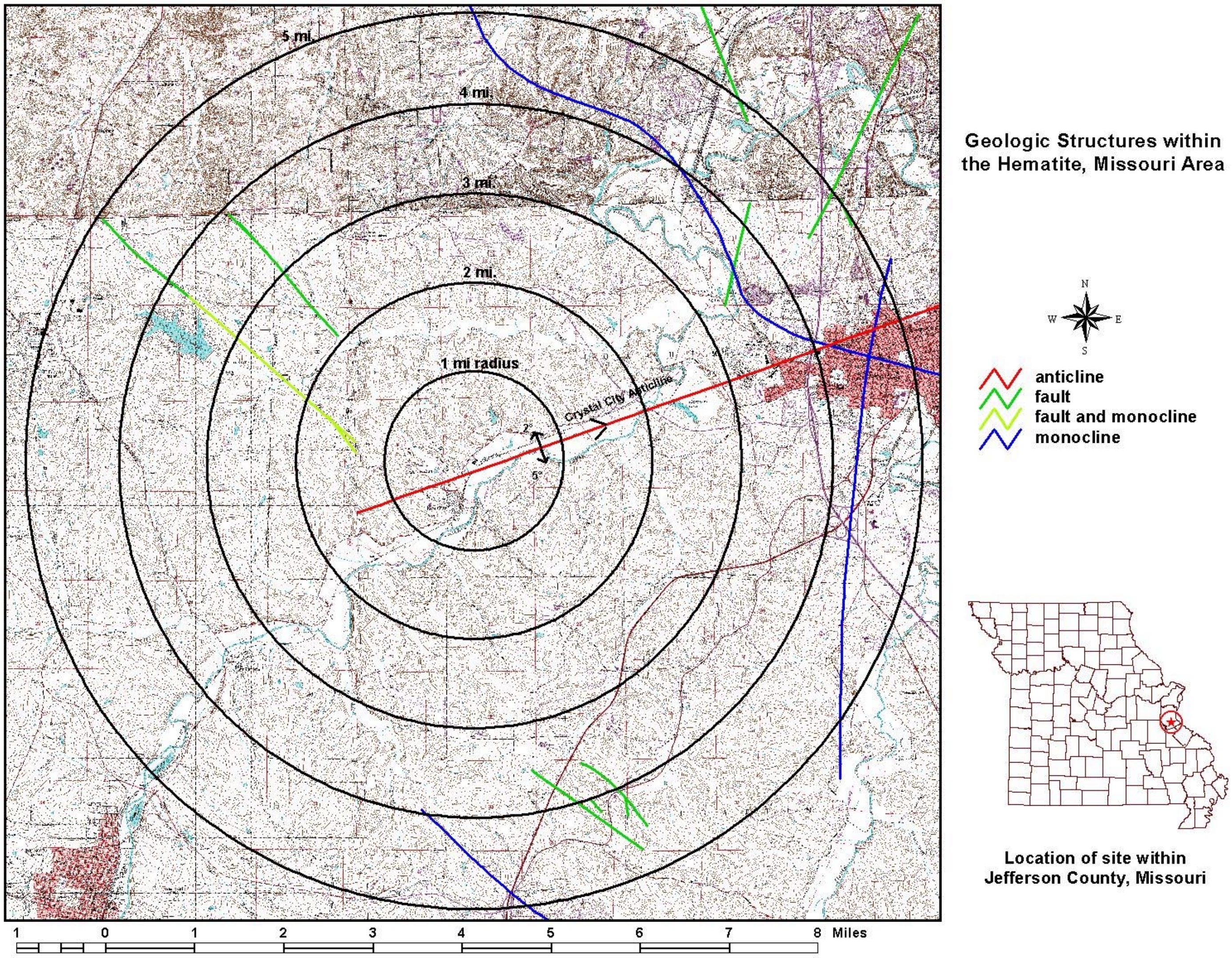

Figure 3-3 Hematite Area Faults

3.4 Water Resources

There are several surface water features on or in close proximity to the site as shown in Figure 1-3. Tributaries in the area of the site flow generally southeastward or northwestward from the highlands to their points of confluence with Joachim Creek, which flows along the southeast site boundary.

Groundwater is widely used within five miles of the site as a source of domestic and industrial water. According to an U.S. Environmental Protection Agency (EPA) field investigation report, "Preliminary Assessment, Hematite Radioactive Site, Hematite, Jefferson County, Missouri," 1990 (Ref. 16), most of the residents in the community of Hematite and nearby Lake Virginia receive their drinking water from Public Water District No. 5. The report also states that surface water is not used for drinking water within a four-mile radius of the site.

In preparation for the site Remedial Investigation (RI), a wetland and surface water assessment was conducted in November 2003 to delineate and classify potentially jurisdictional wetlands and surface water bodies at the Hematite site (Ref. 17). The single potential wetland identified on the site is located in a small depression south of the facility buildings between the railroad berm and a gravel road that goes from the vicinity of the facility buildings to the south towards Joachim Creek (see Figure 3-4). The wetland is a small, isolated, forested/scrub wetland that is confined to the south and southwest by the gravel road and to the north by the railroad berm. There are no inputs or outputs to the wetland, and hydrology appears to be the result of precipitation, which ponds between the road and railroad.

3.4.1 Surface Water Characteristics

Streams, Lakes, and Impoundments

Jefferson County receives an average of 38 in. of precipitation per year (Ref. 18). A fraction of this precipitation runs off the surface or returns to the atmosphere as a result of evapotranspiration, while the remainder infiltrates into the subsurface. Most of the infiltration follows short flow paths in soils and alluvial sediments and discharges into local streams. The remaining flow enters the bedrock and recharges bedrock aquifers.

Joachim Creek, the largest stream near the site, is a permanently flowing stream (Ref. 19). A number of intermittent streams flow into Joachim Creek in the site area. Tributaries to Joachim Creek and other surface water features on or near the site include the following:

- The Site Spring flows an estimated 1 to 10 gallons per minute (gpm) most of the year. The spring is likely a result of fracture flow in the Jefferson City-Cotter Dolomite, which receives its source water from the hills northwest of the Hematite site.

- The Site Pond is a small concrete dam impoundment southwest of the central site tract. It receives flow from the Site Spring and the storm water runoff from the area of the Hematite facility (see Fig. 1.4 for the outfall location).
- The Site Creek is the effluent from below the dam of the Site Pond. It also receives discharge from the Hematite facility's sanitary water system (see Fig. 1.4 for the outfall location). It flows through a culvert beneath the railroad track and joins the effluent from the Lake Virginia drainage basin.
- The combined Lake Virginia/Site Creek tributary flows east to Joachim Creek.
- The Northeast Site Creek flows southeast, then east to its confluence with the effluent of East Lake tributary, and then to Joachim Creek.
- East Lake, located east of the Hematite facility, is an earth-impoundment lake used as a water supply for cattle. It is reported to never have been used in conjunction with Hematite facility operations.
- North Lake Tributary is the effluent drainage from North Lake and North Tributary. This tributary crosses the terrace west of East Lake.
- North Tributary is an intermittent stream west of North Lake (Ref. 19).

Quantitative data regarding flow quantity, duration, peak discharge, etc. are not available for all of these features. However, some observations can be made:

- The Site Spring flows continually.
- The ponds and lake on the site hold water year round. (Flow is measured at the Site Pond dam and reported quarterly to the MDNR Water Pollution Control Program.)
- The tributary streams flow intermittently.
- Joachim Creek is perennial. Based on flow gauge information from the U.S. Geological Survey, the annual mean flow is approximately 132 cubic feet per second (cfs). The seasonal mean flows are: 330 cfs (spring), 12 cfs (summer), 16 cfs (fall), and 169 cfs (winter). Joachim Creek flows into the Mississippi River near Herculaneum, Missouri. MDNR reports that there are no registered major water users that take water from Joachim Creek, and there are no public water systems listed in the "Census of Missouri Public Water Systems 2004" that take water from the creek.

There are two water control structures on the site—the Site Pond dam and the East Lake dam. The Site Pond dam is made of concrete and is approximately 32 ft. long, 16 in. wide, and 40 in. from the footing to the top of the dam. The East Lake has an earthen dam, which is approximately 175 ft. long.

There are two lakes within a one mile radius of the site that have water control structures. North Lake is located northeast of the site and has an earthen dam approximately 200 ft. in length. Lake Virginia is located southwest of the site and has an earthen dam structure.

With the exception of Lake Virginia (actually a small pond), there are no known water obstructing barriers within 5 miles upstream of the Hematite facility.

The drainage channels for all of the above structures cross through the site boundaries and empty into Joachim Creek.

Outfalls

The Hematite facility is currently discharging water to three outfalls (see Figure 1-4): 001—sanitary wastewater, 002—site dam overflow, and 003—storm water. Discharges are performed under National Pollutant Discharge Elimination System (NPDES) permit number MO-0000761, which allows wastewater discharges to an unnamed tributary of Joachim Creek. The permit effluent and monitoring requirements are listed in Table 3-1.

Table 3-1 NPDES Effluent Limitations and Monitoring Requirements

Outfall Number & Effluent Parameters	Units	Final Effluent Limitations			Measurement Frequency
		Daily Maximum	Weekly Average	Monthly Average	
Outfall 001					
Flow	MGD	[1]	NA	[1]	once/month
BOD[3]	mg/L	NA	45	30	once/quarter[2]
TSS[3]	mg/L	NA	45	30	once/quarter[2]
pH	SU	[4]	NA	[4]	once/quarter[2]
Fecal Coliform[5]	#/100mL	1000	NA	400	once/quarter
Chlorine, Total[5]	mg/L	1.0	NA	NA	once/quarter
Outfall 002					
Flow	MGD	[1]	NA	[1]	once/month
Fluoride	mg/L	1.2	NA	1.2	once/quarter[2]
TSS	mg/L	NA	45	30	once/quarter[2]
pH	SU	[4]	NA	[4]	once/quarter[2]
Oil & Grease	mg/L	15	NA	10	once/quarter[2]
Radioactive Material[3,6]	pCi/L	NA	[1]	NA	weekly
Outfall 003					
Flow	MGD	[1]	NA	[1]	once/month
BOD	mg/L	NA	45	30	once/month
TSS	mg/L	NA	45	30	once/month
pH	SU	[4]	NA	[4]	once/month
Oil & Grease	mg/L	NA	NA	10	once/month
Temperature	°F	[7]	NA	[7]	once/month
Fluoride	mg/L	2.2	NA	1.2	once/month

BOD – Biochemical Oxygen Demand
TSS – Total Suspended Solids
[1] Monitor requirement only
[2] Once per quarter during the months of February, May, August, and November.
[3] A composite sample made up from a minimum of four grab samples collected within a 24-hour period with a minimum of two hours between each grab sample.
[4] pH is measured in pH units and is not to be averaged. The pH is limited to the range of 6.0-9.0 pH units.

[5] Final limitations and monitoring requirements for Fecal Coliform and Total Residual Chlorine are applicable only during the recreational season from April 1 through October 31. Fecal Coliform and Total Residual Chlorine must be measured during May, August, and October of each calendar year.
[6] Monitoring required for gross alpha and beta radiation in accordance with NRC License No. SNM-33.
[7] Effluent shall not elevate or depress the temperature of the receiving stream beyond the mixing zone more than 5°F. The stream temperature beyond the mixing zone shall not exceed 90°F due to the effluent. Temperature shall be monitored at 40 yards below Outfall 003 and upstream of Outfall 003 for comparison purposes.

On April 15, 2005, Westinghouse submitted an application to renew its plant site NPDES permit. In its renewal application, Westinghouse proposed modifying the monitoring program for Outfalls 001 through 003 and adding three outfalls that represent other possible locations for point source discharges of surface water runoff. The three existing outfalls and the three additional outfalls are listed as follows:

1. Outfall 001 – Discharge from the facility sanitary wastewater treatment plant to the unnamed tributary downstream of the Site Pond
2. Outfall 002 – Discharge from the Site Pond to the unnamed tributary
3. Outfall 003 – Discharge to the Site Pond from facility storm drains
4. Outfall 004 (proposed) – Discharge from the east culvert, which collects runoff from paved and unpaved areas east of Building 260 and conveys it to the unnamed, intermittent stream located to the east of the central site tract
5. Outfall 005 (proposed) – Discharge from the south culvert, which collects runoff from paved and unpaved areas southwest of Building 252 and conveys it to the low-lying area north of the Union Pacific railroad tracks
6. Outfall 006 (proposed) – Intermittent stream east of the central site tract that collects runoff from the east culvert (proposed Outfall 004) and non-point-source runoff from paved and unpaved areas on the eastern side of the central site tract

In conjunction with the discharges to and from the Site Pond, these additional outfalls include all of the locations from which point-source discharges of facility runoff could occur during site decommissioning.

Table 3-2 describes Westinghouse's proposed monitoring programs for all six outfalls defined in its permit renewal application.

Table 3-2 Proposed Discharge Monitoring Schedule

Parameter	Outfall Number and Description					
	001	002	003	004	005	006
	Sanitary Sewer	Site Pond Dam	Storm Sewer	East Culvert	South Culvert	Intermittent Stream
Flow	Monthly	Monthly	--	--	--	--
BOD	Quarterly	--	Monthly	--	--	--
Total Suspended Solids	Quarterly	Quarterly	Monthly	Quarterly	Quarterly	--
pH	Quarterly	Quarterly	Monthly	Quarterly	Quarterly	Quarterly
Temperature	--	--	Monthly	--	--	--
Oil & Grease	--	Quarterly	Monthly	--	--	--
Fecal Coliform	Quarterly	--	--	--	--	--
Residual Chlorine	Quarterly	--	--	--	--	--
Radioactive Parameters						
Gross Alpha	Monthly	Monthly	--	Quarterly	Quarterly	Quarterly
Gross Beta	Monthly	Monthly	--	Quarterly	Quarterly	Quarterly
Site Constituents						
Trichloroethylene	--	--	--	Quarterly	Quarterly	Quarterly
Tetrachloroethylene	--	--	--	Quarterly	Quarterly	Quarterly

In accordance with the NRC License No. SNM-33, the Hematite facility is required to monitor wastewater for gross alpha and gross beta radiation. The monitoring locations and frequency are listed in Table 3-3.

Table 3-3 NRC Monitoring Locations, Frequency, and Sample Type

Monitoring Location	Frequency	Sample Type
Effluent discharge at the dam (Outfall 002)	weekly	24-hour composite
Joachim Creek upstream and downstream from Site Creek	monthly	Grab
Confluence of Joachim Creek and Site Creek	quarterly	Grab
On-site water supply well	monthly	Grab

Monitoring Location	Frequency	Sample Type
Hematite water supply well	quarterly	Grab

Floods

Floods that might occur at the site will produce different flood levels depending upon the flow rate of Joachim Creek. While historical records (maximum observed level of 431 ft. above mean sea level) and analysis by the Federal Emergency Management Agency (FEMA) show that a site flood is not likely, it is still considered remotely possible. If a flood of larger magnitude (greater than 432 ft. above mean sea level) were to occur, water at the plant facility would rise, but there is not expected to be any significant water velocity associated with the flooding. The reason for the minimal water velocity is that the railroad track, which is located between Joachim Creek and the plant, would serve to isolate the plant area from the main stream flow. The 100- and 500-year flood boundaries for Joachim Creek are shown in Figure 3-4.

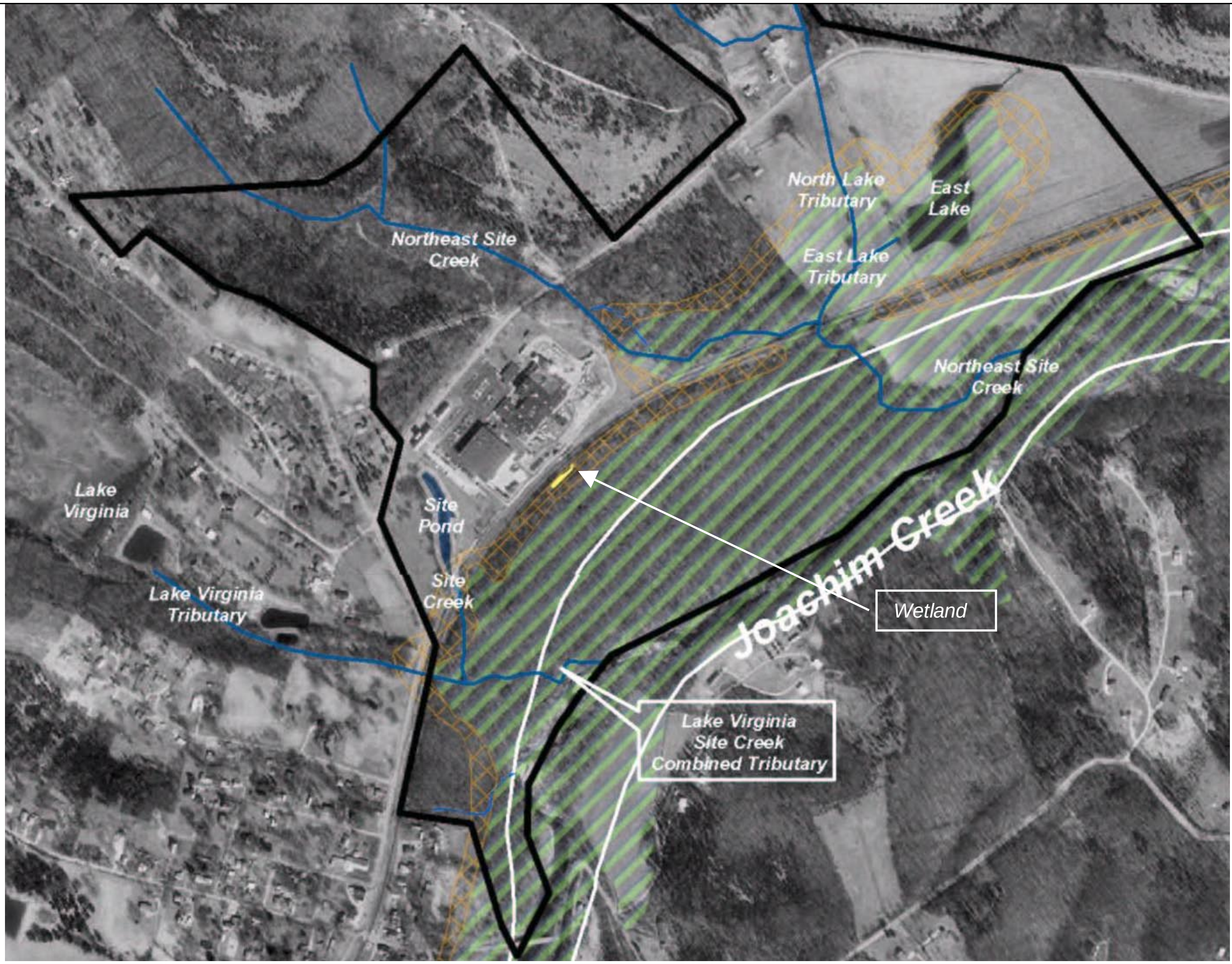

Figure 3-4 100- and 500-Year Flood Boundaries

3.4.2 Groundwater Characteristics

As described in the Hematite RI report (Ref. 20), the components of the hydrogeologic system near the Hematite site include the following:

- Overburden—unconsolidated clays, sands, and gravels that overlie bedrock in the floodplain of Joachim Creek
- Jefferson City-Cotter Formation—dolomite with some sandstone interbeds and cherty intervals
- Roubidoux Formation—dolomite and sandy dolomite with some sandstone interbeds and cherty intervals

Flow within the overburden generally is from areas of high elevation toward lower elevation, with local streams being the zone of discharge. Within this general framework, the principal groundwater flow paths in overburden are dictated by the occurrence of porous and permeable lithologies such as sands and gravels. MDNR (Ref. 21) estimated the base-flow recession (the amount of water that will flow in a stream after a 30-day rainless period) from 1961 through 1965 on the Joachim Creek as 0.2 $ft.^3$/second. These data indicate that Joachim Creek is a gaining stream, and therefore, a recipient of shallow groundwater discharge (Ref. 20). This observation suggests that groundwater in the overburden at the Hematite site migrates from the vicinity of the plant facility toward Joachim Creek where it discharges.

A groundwater mound is associated with the Hematite site (Ref. 20) and has a significant impact on the potentiometric surface. Groundwater flow in the upper Jefferson City-Cotter Dolomite appears to be affected by the mounding, and components of flow radiate from the Hematite site toward the northeast (along bedding planes) and toward the southeast (in a transmissive zone) within this bedrock unit. Below the Jefferson City-Cotter Dolomite, the current direction of groundwater flow appears to reflect a northeasterly trajectory, which is consistent with the regional groundwater flow direction in the Roubidoux Formation (Ref. 22).

Estimates have been made of groundwater flow velocities based on Darcy's law (Ref. 20) for a variety of potential flow paths. The results obtained for overburden range between approximately 20 and 300 ft/year, and the estimated velocity values in bedrock range from 2 to >300 ft/year.

Figure 3-5, developed from bedrock boreholes at the Hematite site (Ref. 20), delineate three tentatively identified hydrostratigraphic units (HSUs): Jefferson City-Cotter, Jefferson City-Roubidoux contact zone, and Roubidoux Formation. These HSUs were selected based on geology (e.g., they are strata-bound and parallel to the regional dip). The identification of these HSUs is based on historical and RI data and should be considered as a working conceptual model that might undergo revisions as more data are collected. Based on hydraulic conductivity results (Ref. 20), the following conclusions can be reached:

- There is an upper transmissive zone that lies within the Jefferson City-Cotter HSU and appears to be most closely associated with boreholes completed within about 50 ft. of the overburden/Jefferson City-Cotter interface.
- The Jefferson City-Roubidoux contact zone is a region of variable, but typically low, transmissivity.
- There is a deeper, second zone of high transmissivity (Roubidoux HSU), defined by injection test results (Ref. 23), that lies immediately below the relatively low transmissivity Jefferson City-Roubidoux contact zone.

Vertical head gradients are downward from the fine-grain (shallow) to coarse-grain (deep) overburden. Between the deep overburden and Jefferson City-Cotter HSU, gradients are downward in the vicinity of the Hematite facility and upward near Joachim Creek. Vertical gradients tend to be upward from the Jefferson City-Cotter HSU and deeper HSUs. However, until approximately mid-2003, this gradient was reversed (i.e., downward) as a result of the significant lowering of heads in the Roubidoux Formation due to pumping of water supply wells operated by the city of Festus (located approximately 4 miles east of the Hematite facility). Startup of a new “collector” well near the Mississippi River permitted the city to place its four production wells on standby.

The Hematite site is located in the Salem Plateau groundwater province. This province contains two separate aquifers, the Ozark and St. Francois. The shallower Ozark aquifer is hydraulically separated from the deeper St. Francois aquifer by the St. Francois confining layer. The near-surface HSUs at the Hematite site were characterized in “Hydrologeological Investigation and Groundwater, Soil and Stream Characterization” (Ref. 24).

According to “Water Resources Report 30” (Ref. 25), domestic and industrial water wells in the regional area produce water from the Powell-Gasconade aquifer group of the Ozark Aquifer, which includes the Jefferson City Dolomite and the Roubidoux Formations. The Jefferson City Dolomite is generally not capable of sustained water production because of its low storage capacity and is subject to failure during drought or sustained pumping (Ref. 25). However, based on a survey (Ref. 26) of water-producing wells within a 2-mile radius of the Hematite site, the Jefferson City Dolomite appears to be adequate for individual/private-use wells, several of which were completed in this formation. However, most of the wells included in the survey intersected both the Jefferson City and the Roubidoux Formations.

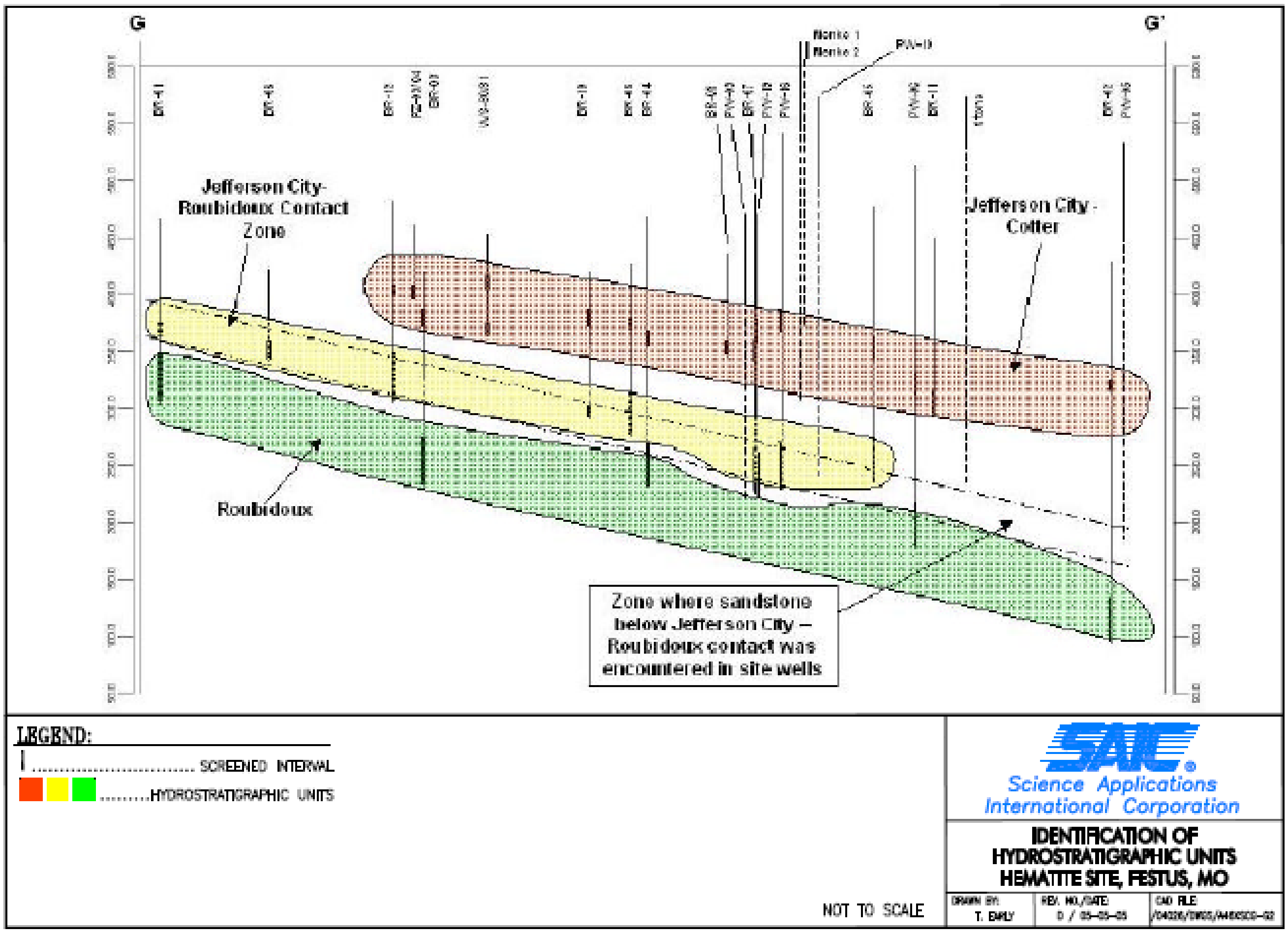

Figure 3-5 Identification of Hydrostratigraphic Units

3.5 Ecological Resources

A letter dated December 10, 2004 from the U.S. Fish and Wildlife Service states that "…no federally listed, proposed or candidate species or critical habitat occurs on or near the project site…" From pedestrian surveys, no significant ecological resources have been identified within the ten-acre central site tract, where almost all the soil and surface water disturbances are expected to occur during decommissioning. The central site tract consists of gravel drives, asphalt parking lots, some mowed turf grass areas, and the former industrial buildings, and this area does not provide desirable habitat for wildlife.

3.6 Meteorology, Climatology, and Air Quality

3.6.1 Meteorology and Climatology

The *Missouri Water Atlas* (Ref. 18) was consulted to determine local precipitation characteristics. The area of the Hematite site receives an average of 38 inches of precipitation annually with 12 inches of annual runoff. Approximately 45 percent of the total yearly precipitation falls from April through September. The maximum 10-day precipitation event would yield 9 inches of precipitation in a given 25-year span. Snowfall has averaged less than 20 inches per winter season since 1930. December, January, and February are the driest months, while April and May are normally the wettest. It is not unusual to have extended periods (1 to 2 weeks or more) without appreciable rainfall from the middle of the summer into the fall. Thunderstorms occur on average between 40 to 50 days per year, mostly between May and August. The U.S Department of Commerce reports a mean annual frequency of about 8 tornadoes per year for a 30-year period. The probability of a tornado striking the site location is computed as 7.51×10^{-4}, and the recurrence interval is 1,331 years (Ref. 27).

General climatological characteristics of the site area can be inferred from those of St. Louis, the location of the nearest U.S. Weather Bureau recording station. The region experiences a modified continental climate without prolonged periods of extreme cold, extreme heat, or high humidity. Generally, air masses moving northward from the Gulf of Mexico bring warm, moist air, while colder, drier air masses typically approach from the north. Invasion of the region by these air masses, along with local weather phenomena, produce a variety of weather conditions. Winters are brisk but seldom severe. Minimum temperatures remain as cold as 32˚F or lower for fewer than 20 to 25 days in most years. Summers are warm with a maximum temperature of 90˚F or higher for an average of 35 to 40 days per year (Ref. 27).

3.6.2 Air Quality

The Clean Air Act was established to protect the public safety, health, and welfare from the effects of a variety of air pollutants. National Ambient Air Quality Standards (NAAQS) were established for sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead. Missouri has adopted the federal NAAQS and added hydrogen sulfide and sulfuric acid emission standards. In order to monitor the attainment of the NAAQS, the EPA has designated Air Quality Control Regions (AQCR) across the United States. The Hematite site is located in the Metropolitan St. Louis Interstate Air Quality Control Region as defined in section 302(f) of the Clean Air Act, 42 U.S.C. 1857h(f) (Ref. 28). This AQCR has been designated by the EPA as an ozone non-attainment area, and a portion of Jefferson County, particularly the city of Herculaneum, has been designated as a lead non-attainment area.

Concentrations of radionuclides in air effluents have been determined at Hematite based on historic sampling activities as part of license-required monitoring. A significant amount of this environmental monitoring data has been accumulated during the history of the site license and would be used as a standard for decommissioning activities.

Gross alpha analysis is performed on air effluent samples. The average concentration for 2003 (stack) samples was 2.27E-15 μCi/ml as compared to the limit given in 10 CFR 20 Appendix B (Ref. 29) of 6.00E-14 μCi/ml (e.g., Class Y uranium).

During plant operations, environmental air emissions were monitored from 19 stacks. The 2002 radiological results for the air emissions were loaded into COMPLY Code-V1.6 and executed at Level 1, the most conservative level. The results of the COMPLY run indicated that the Hematite facility was in compliance with 40 CFR 61, National Emissions Standards for Hazardous Air Pollutants (Ref. 30), and 10 CFR 20.1101.

3.7 Noise

This section describes the noise baseline at and near the site of the proposed action. Although no previous noise studies have been conducted, vehicular traffic on State Road P and trains on the Union Pacific rail line dominate the ambient noise levels near the Hematite site. The noise levels associated with the decommissioning process at the site are presently no greater than while performing normal licensed operations during fuel production. The Hematite site is located in a predominantly rural area, and outside noise sources are primarily vehicles, trains, and farm machinery. At any location on or around the site, both the magnitude and frequency of environmental noise might vary considerably over the course of the day and throughout the week. These variations are caused in part by changing weather conditions, local traffic conditions, train schedules, and the seasonal effects of vegetative cover.

Some residential areas border the Hematite site. Westinghouse owns three single-family houses on the property and leases them as residences. A subdivision is located south of the site across Joachim Creek.

During site decommissioning activities, standard noise abatement measures would be implemented, as necessary, based on the type of work and noise levels. These noise abatement measures might include:

- Scheduling work to minimize noise impacts
- Locating stationary noise sources, such as electrical generators or air compressors, as far from noise-sensitive areas as possible
- Using electrically or hydraulically powered impact tools when feasible
- Using the best available noise control techniques where possible

3.8 Historic and Cultural Resources

3.8.1 Regional History

Prior to European settlement, the area that now includes Jefferson County was inhabited by Delaware, Missouri, Osage, and Shawnee tribes. The Delaware, Missouri, and Osage tribes lived along the river valleys while the Shawnee tribes were principally wanderers. The earliest European settlers to Jefferson County arrived in the mid-1770s and acquired land grants from the Spanish authorities. These early settlements rarely extended much beyond the shoreline of the Mississippi River. In 1800, the Spanish territory transferred the property of the county to the French who then transferred the property to the United States in the 1803 Louisiana Purchase. The county was established in 1818 out of portions of St. Louis and St. Genevieve Counties. Early settlers in the county were attracted to the agricultural lands and mining opportunities around such towns as Herculaneum. The first railroad entered the county in 1857 and prompted the continued development of industrial and manufacturing facilities throughout the county. The county continued to increase in population throughout the late nineteenth and early twentieth centuries. In the 1930's, extensive improvements were made to the infrastructure of the county. After World War II, the county began to receive large numbers of St. Louis residents who were relocating to suburban areas.

3.8.2 Site History

In the mid-1950's, Mallinckrodt Chemical Works purchased 150 acres of land from a local dairy farmer. In March 1956, Mallinckrodt began to construct the first privately owned and operated plant designed to produce enriched uranium compounds for nuclear reactor fuel element use (Ref. 31). Of the 150 acres that were initially purchased, the production facility originally occupied approximately eight acres. The Hematite facility began operations in July 1956 and immediately began processing uranium fuel for the United States government. The facility continued to operate under Mallinckrodt Chemical Works until January 2, 1959 when the business and facilities of the nuclear fuels division, including all of the facilities located at Hematite, Missouri, were transferred to Mallinckrodt Nuclear Corporation, a wholly owned subsidiary of the company. In September 1960, Mallinckrodt Nuclear Corporation was liquidated, and all assets and business were transferred back to the parent company, Mallinckrodt Chemical Works. At that time, operations at Hematite and Weldon Spring (which was run by Mallinckrodt Chemical Works for the Atomic Energy Commission) formed the Nuclear Division within Mallinckrodt Chemical Works.

Mallinckrodt Chemical Works operated the facility until May 1961 at which time ownership was transferred to the United Nuclear Corporation, a new corporation owned, in part, by Mallinckrodt Chemical Works. In 1970, United Nuclear Corporation and Gulf Nuclear Corporation entered into a joint venture forming Gulf United Nuclear Fuels Corporation, which owned and operated the facility until the spring of 1973 when United Nuclear Corporation closed the plant and began decommissioning. General Atomic Company purchased the property in January 1974 and then sold it to Combustion Engineering Inc. (CE) in May 1974. In 1989, Asea Brown Boveri (ABB) acquired the stock of CE and began operating the facility as ABB Combustion Engineering. In April 2000, Westinghouse purchased the nuclear operations of ABB, which included the Hematite site.

Primary functions at the facility throughout its history have included the manufacture of uranium metal and uranium compounds from natural and enriched uranium for use as nuclear fuel. Specifically, operations included the conversion of uranium hexafluoride (UF_6) gas of various uranium-235 (U-235) enrichments to uranium oxide, uranium carbide, uranium dioxide pellets, and uranium metal. These products were manufactured for use by the federal government, government contractors, and commercial and research reactors approved by the Atomic Energy Commission. Research and development was also conducted at the plant, as were uranium scrap recovery processes. During the period prior to CE's purchase of the site in 1974, government projects dominated the operations at the facility. Much of the work on behalf of the government was classified, and therefore, specific details regarding the exact nature of the processes are not known. Examples of known projects during this time include:

- Production of uranium fuel for nuclear submarines and a D1G destroyer reactor
- Supply of specialized uranium oxides for the Army Package Power Reactor
- Supply of high-enriched oxides for a General Atomics gas-cooled reactor
- Production of high-enriched fuel for materials test reactors used by the U.S. Navy
- Supply of uranium-beryllium pellets for use in the SL-1 reactor
- Production of high-enriched uranium zirconia pellets for a naval reactor
- Production of high-enriched oxides for General Atomics for use in nuclear rocket projects

Throughout the history of the facility, various buildings were constructed and demolished or incorporated into other buildings as necessary.

3.9 Visual/Scenic Resources

The viewshed surrounding the Hematite site is fairly characteristic of a mixed rural/industrial area, as shown in Figure 3-6. The site is located on a remnant flood terrace of the nearby Joachim Creek. Bottomland forest and Joachim Creek are located to the south of the facility. To the east of the facility is a pasture with a medium-size pond (East Lake). To the north of the facility is an upland forest located on a small bluff. The upland forest area also contains two small stream valleys and a limited amount of pasture land. The upland and bottomland portions of the site are divided by State Road P. The upland areas to the north of the plant provide the best viewshed within the property; however, access to the bluffs is limited. The majority of people passing through the site do so on State Road P. Consequently, the viewshed is limited to the portions of the property that are visible from State Road P. These views consist of the bottomland forest, pasture fields, East Lake, and plant facilities located south of State Road P and the forested bluffs and stream valleys located north of State Road P. State Road P is not a major Missouri route, and the average annual daily traffic count for 2002 was 2,570 vehicles per day (Ref. 9).

Eastern side of Main Buildings, facing west.

Building 115 and east side of 255 and 260, facing south.

Facilities, facing south.

Wood Barn and Sign in front of facilities, facing west.

Westinghouse SAIC An Employee-Owned Company

Visual Resources
Westinghouse Facility
Hematite, MO

Figure 3-6 Visual Resources

3.10 Socioeconomics

Jefferson County was historically a rural county, but its close proximity to St. Louis has created a large influx of population in the last fifty years. Comparison of the 1990 and 2000 census (Ref. 32 and 33) indicates a 16 percent increase in population during the ten-year census period (Table 3-4). The 2000 U.S. Census indicated that the population is predominantly white (98%).

Table 3-4 Population Trends, 1990-2000

Location	1990 Population	2000 Population	Percent Change
State of Missouri	5,116,901	5,595,211	9.3%
Jefferson County	171,380	198,099	15.6%
Census Tract 7009	3,848	4,501	17.0%
Census Tract 7010	6,716	7,757	15.5%

Unemployment in the county dropped from 7.7 percent in 1990 to 3.2 percent in 2000. The majority of the workforce is employed in the retail, service, and government sectors. The Hematite site is within the boundaries of two census tracts (Tract 7009 and Tract 7010). Census data from these two tracts were used to compare localized socioeconomic data with data at state and county levels. As shown in Table 3-5, significant employment sectors include manufacturing (16.6%), educational, health, and social services (16.5%), retail trade (12.7%), and construction (10.4%). The median household income for the county was $46,338 in 1999.

Table 3-5 Number of Employees by Industrial Sector, 2000

	Number of Employees			
Industry	Missouri	Jefferson County	Census Tract 7009	Census Tract 7010
Agriculture, forestry, fishing, hunting, and mining	58,415 (2.2%)	556 (0.6%)	5 (0.2%)	27 (0.7%)
Construction	182,858 (6.9%)	10,414 (10.4%)	184 (9.1%)	405 (10.8%)
Manufacturing	393,440 (14.8%)	16,563 (16.6%)	285 (14.1%)	652 (17.5%)
Wholesale trade	97,021 (3.7%)	4,045 (4.1%)	56 (2.8%)	153 (4.1%)
Retail trade	315,872 (11.9%)	12,680 (12.7%)	306 (15.1%)	426 (11.4%)

Industry	Number of Employees			
	Missouri	**Jefferson County**	**Census Tract 7009**	**Census Tract 7010**
Transportation, warehousing, and utilities	150,641 (5.7%)	5,921 (5.9%)	108 (5.3%)	274 (7.3%)
Information	80,623 (3.0%)	2,711 (2.7%)	61 (3.0%)	93 (2.5%)
Finance, insurance, real estate, and rental and leasing	177,651 (6.7%)	6,701 (6.7%)	133 (6.6%)	210 (5.6%)
Professional, scientific, mgmt., admin., and waste mgmt. services	198,547 (7.5%)	7,979 (8.0%)	106 (5.2%)	188 (5.0%)
Educational, health, and social services	541,715 (20.4%)	16,459 (16.5%)	376 (18.6%)	722 (19.3%)
Arts, entertainment, recreation, accommodation, and food services	206,295 (7.8%)	7,206 (7.2%)	166 (8.2%)	251 (6.7%)
Other services	132,940 (5.0%)	5,843 (5.9%)	113 (5.6%)	186 (5.0%)
Public administration	121,906 (4.6%)	2,763 (2.8%)	122 (6.0%)	146 (3.9%)
Total	**2,657,924**	**99,837**	**2,021**	**3,733**

Source: U.S. Bureau of the Census 2000

The nearest populated settlement to the Hematite site is the community of Hematite, Missouri. During the 1990 census, Hematite had a population of 125 people. The closest community of significant size, located 3.5 miles northeast of the site, is the combined cities of Festus and Crystal City. The 2000 combined population of the two communities was 13,900 people.

Employment trends for the two census tracts surrounding the Hematite site are more closely related to the state of Missouri than to Jefferson County. Jefferson County experienced a 4.5 percent decline in unemployment during the last census period while the two census tracts, 7009 and 7010, experienced a 0.6 percent and a 1.0 percent increase, respectively (Table 3-6).

Table 3-6 Employment Trends, 1990-2000

Location	1990 Unemployment Rate	2000 Unemployment Rate	Percent Change
State of Missouri	6.2	5.3	-0.9%
Jefferson County	7.7	3.2	-4.5%

Census Tract 7009	5.8	6.4	0.6%
Census Tract 7010	5.0	4.0	-1.0%

3.11 Public and Occupational Health

Numerous radiological and chemical constituents have been used in the activities of the Hematite site. The presence of these constituents would present potential occupational health risks during the site decommissioning. The primary radionuclides of concern at the site include uranium-234 (U-234), uranium-235 (U-235), uranium-238 (U-238), and technetium-99 (Tc-99). Other radionuclides, thorium-232 (Th-232) and progeny, americium-241 (Am-241), neptunium-237 (Np-237), and plutonium-239 (Pu-239), are potentially present due to the historical use of reprocessed uranium at the site. Production and support activities involving the radionuclides of concern occurred in and around the site production facilities.

Chemicals historically used at facility included anhydrous ammonia, liquid nitrogen, potassium hydroxide, hydrochloric acid, nitric acid, hydrogen peroxide, isopropyl alcohol, hydrogen fluoride, trichloroethane, trichloroethylene (TCE) and perchloroethylene (PCE).

Available accident reports for the Hematite facility are limited to the years 2000 through 2004, during Westinghouse's ownership. The facility ceased manufacturing operations in June 2001. There has been a significant decrease in the number of workers present and man-hours worked since the completion of manufacturing operations. In fiscal year 2001, the facility had a total of 438,404 work-hours with 67 non-OSHA (Occupational Safety and Health Administration) injuries or illnesses, 50 OSHA cases, and no fatalities. In fiscal year 2002, there were 115,832 work-hours with 11 non-OSHA injuries or illnesses, five OSHA cases, and no fatalities. In fiscal year 2003, there were 86,736 work-hours with one non-OSHA injury or illness, and no OSHA cases or fatalities. In fiscal year 2004, there were 52,208 work-hours with no non-OSHA injuries or illnesses, no OSHA cases, and no fatalities. In April and May of 2004, there were 8,888 work-hours with no non-OSHA injuries or illnesses, one OSHA case, and no fatalities.

3.12 Waste Management

In 2001, Westinghouse ceased fuel production operations at the Hematite facility and has no future plans for operating the site as a nuclear fuel processing facility. Therefore, current waste generation is limited to specifically approved decommissioning activities performed under NRC License No. SNM-33. This might include such activities as equipment removal, above-grade soil and limestone pile removal, and building decontamination and/or demolition. Waste generated from these activities is being sent to licensed, commercial processors or disposal sites as described in Section 3.2.2.

Additional waste that is expected to be generated as a result of the proposed action (Section 1.2) is addressed in Section 4.13.2.

4.0 ENVIRONMENTAL IMPACTS

This section of the ER provides a description and analysis of the potential environmental consequences associated with the implementation of the proposed action as described in Section 2.0. The basis for the evaluation of the potential social, economic, and environmental impacts was established and defined as the baseline condition in Section 3.0.

4.1 Land Use Impacts

4.1.1 No-Action Alternative

The no-action alternative could result in the continued migration of radiological and chemical contamination into soil, surface water, and groundwater in the vicinity of the site. Over the long term, this could have an adverse impact on current agricultural and suburban residential uses of the land in the vicinity of the site.

4.1.2 Proposed Action

Decommissioning activities at the Hematite site would not cause a significant change to local land use and could potentially lead to alternative, beneficial long-term uses of the site. Because decommissioning activities are concentrated in the ten-acre central site tract, no impacts to land use in surrounding areas are expected to result from the proposed action.

4.2 Transportation Impacts

4.2.1 No-Action Alternative

The no-action alternative would have no impact on current traffic or transportation facilities in the area.

4.2.2 Proposed Action

Implementation of the proposed action would result in a short-term increase in the use of local, regional, and national transportation facilities, not only for the additional workers and equipment required for the decommissioning activities but also for the transport of waste material from the site to licensed processing or disposal facilities or to railheads for transfer for rail transport to such facilities. The transportation facilities around the Hematite site have served well for previous, similar transportation activities and have sufficient capacity to accommodate the additional traffic that would be required for the decommissioning activities.

Traffic increases from the staffing required to conduct the proposed action would have minimal impact on the local and regional traffic conditions. The staffing levels for the proposed action would likely be less than staffing levels during historical full operation of the facility.

Potential routes for transporting contaminated waste from the Hematite site are discussed in Section 3.2.2. The likely routes include roads and highways with sufficient capacity to handle the transportation of materials from the site to selected disposal or processing facilities. These routes have been previously used for radioactive waste shipments. The designated shippers would be required to have the appropriate state permits and licenses for the transportation of radioactive/hazardous materials and to comply with applicable Department of Transportation (DOT) regulations and directives.

Transportation of Radioactive Material

In order to bound the radiological exposure associated with the transportation of waste materials generated during the decommissioning of the Hematite site, the following analysis has been prepared using the approach presented in NUREG-0170, "Final Environmental Statement on the Transportation of Radioactive Material" (Ref. 34). The following calculations have been taken at upper-bound estimates in order to assure that the actual environmental impacts will be well within these estimates.

a. Normal Conditions of Transportation – Current plans for the transport of waste involve truck transport from the site to an off-site rail spur and rail transport to a disposal site. This analysis is based on a 100-mile distance by truck to the rail spur and a 1,500-mile distance by rail car to the disposal site. The truck is assumed to hold 16.7 cubic yards, and each rail car holds 85 cubic yards. The principal volume of waste would be from the excavation and transport of material from the on-site Burial Pits. This material also contains the highest concentrations of uranium and is therefore used as the basis for analysis. The upper bound for the volume of waste material to be transported is 50,000 cubic yards. This would require approximately 3,000 truck loads and 600 rail car loads. Using 10 rail cars in a train shipment would result in 60 train shipments.

   Because the waste materials must be shipped as fissile exempt material in accordance with both NRC and DOT transportation regulations, this establishes an upper bound for the uranium concentration of 1,070 pCi of U-235 per gram of waste material. Given available information on the amount of uranium placed in the burial pits, the anticipated average concentration would be less than one tenth of the maximum established by the fissile exempt concentration limit. The source term values used for the analysis of normal conditions of transport are shown in Table 4-1.

Table 4-1 Source Term for Normal Conditions of Transport

Nuclide	Volume Concentration (µCi/cm³)	Activity Distribution (%)	Mass Concentration (pCi/g)
U-234	2.11E-03	88.7%	1,758
U-235	1.11E-04	4.7%	93
U-238	1.58E-04	6.6%	132
Total	2.38E-03	100%	1,983

The above values assume an average enrichment of 10% U-235. A series of MicroShield calculations for different enrichments demonstrated that the dose rate above an infinite slab of soil is insensitive to the enrichment level. At 10% enrichment, the unshielded dose rate at 1 meter above a slab of soil containing the above concentrations of uranium is calculated to be only 0.035 mR/hr.

- Truck Transport – driver exposure

  MicroShield calculations of the dose rate at 5 feet from the side of the trunk gives a dose rate of 0.00185 mrem/hr. This is used as the dose rate in the cab. Using a travel distance of 100 miles and an average speed of 15 miles/hr and assuming that 5 truck drivers share the task of transporting the waste to the rail siding, the radiation to the driver is 0.6 mrem over the entire transport campaign. Each driver transports 70 loads. The cumulative dose to all the drivers would be 3 person-mrem.

- Rail Transport – crew exposure

  MicroShield calculations of the dose rate at 152 meters from the end of a rail car give a dose rate of 9.28×10^{-8} mrem/hr. This is used as the average exposure rate to the train crew. Using a travel distance of 1,500 miles and an average speed of 25 miles/hr and a crew of 5 for each train, the radiation dose to a crew member is 5.6×10^{-6} mrem per train trip. Even if the same crew transported all of the waste, the exposure to an individual crew member would be only 3.3×10^{-4} mrem for the entire campaign. The cumulative dose to the entire crew for the campaign would be only 1.7×10^{-3} person-mrem.

The shipment parameter assumptions used above are conservatively consistent with those used in Table 4.6 (Truck) and Table 4.9 (Rail) in NUREG-0170, Volume 1. Table 4.8 (Truck) and Table 4.10 (Rail) provide information on the cumulative dose for the various population groups exposed during transportation. Using the distribution of exposures in those two tables, it is possible to estimate the exposure to other populations as shown in Table 4-2.

Table 4-2 Cumulative Exposure to Various Groups During the Normal Transport of Hematite Waste

Exposed Population	Rail Transport (person-mrem)	Truck Transport (person-mrem)
Crew/Driver	1.70E-03	3.0
Surrounding Population		
On-link	2.27E-05	0.2
Off-link	4.34E-02	0.4
While Stopped	1.70E-03	1.2
Storage	1.32E-03	0.3
Total	4.82E-02	5.1

These conservative calculations demonstrate that the radiation exposure associated with the normal transport of waste associated with the decommissioning of the Hematite site is very small and well within the conclusions presented in NUREG-0170.

b. Accident Conditions of Transportation – This accident analysis is based on a train accident involving 10 rail cars containing a total of 850 cubic yards of waste at the anticipated average concentration for soil in the Burial Pits. Assuming that the entire contents of the ten rail cars are released, the source term for the accident is as shown in Table 4-3.

Table 4-3 Source Term for Accident Condition of Transport

Nuclide	Activity Distribution (%)	Total Activity (Curies)
U-234	88.7%	1.52
U-235	4.7%	0.0826
U-238	6.6%	0.115

Nuclide	Activity Distribution (%)	Total Activity (Curies)
Total	100%	1.72

The calculation of the resulting exposure was performed using the Hotspot code using the above source term and an airborne release fraction of 1 x 10^{-4}. The results are presented in Table 4-4. The results are that the maximum dose from a spill of the entire contents of ten rail cars is 93 mrem at a distance of 62 meters. This calculation is conservative because it assumes a release within a small area rather than the large area that would be associated with ten rail cars.

Table 4-4 Hotspot Version 2.05 General Plume (August 18, 2005, 09:16 PM)

Source term	Hematite Accident Analysis Mix (Mixture Scale Factor = 1.0000E+00)
Hematite Transportation Accident Analysis	
Effective release height	0.00 m
Wind speed (h = 10 m)	1.0 m/s
Distance coordinates	All distances are on the plume centerline.
Stability class	G
Sigma theta	20.0 deg.
Receptor height	1.5 m
Inversion layer height	None
Sample time	10.000 min.
Breathing rate	3.33E-04 m^3/sec.
Maximum dose distance	0.062 km
Maximum CEDE	0.093 rem

Distance (km)	CEDE (rem)	Time-integrated Air Concentration (Ci-sec)/m^3	Ground Surface Deposition ($\mu Ci/m^2$)	Ground Shine Dose Rate (rem/hr)	Arrival Time (hour:min)
0.030	1.2E-02	2.7E-07	1.1E-01	1.2E-08	00:01
0.100	6.3E-02	1.4E-06	6.9E-03	7.1E-10	00:04
0.200	1.8E-02	4.1E-07	1.4E-03	1.4E-10	00:08
0.300	7.5E-03	1.7E-07	5.5E-04	5.7E-11	00:12
0.400	4.0E-03	9.1E-08	2.8E-04	2.9E-11	00:16
0.500	2.4E-03	5.5E-08	1.7E-04	1.8E-11	00:20
0.600	1.6E-03	3.7E-08	1.1E-04	1.2E-11	00:24
0.700	1.1E-03	2.6E-08	8.0E-05	8.3E-12	00:28
0.800	8.5E-04	2.0E-08	5.9E-05	6.2E-12	00:32
0.900	6.6E-04	1.5E-08	4.6E-05	4.8E-12	00:36
1.000	5.3E-04	1.2E-08	3.6E-05	3.8E-12	00:40
2.000	1.2E-04	2.6E-09	7.9E-06	8.3E-13	01:20
4.000	2.6E-05	6.1E-10	1.8E-06	1.9E-13	02:41
6.000	1.1E-05	2.6E-10	7.7E-07	8.0E-14	04:02
8.000	6.3E-06	1.4E-10	4.3E-07	4.5E-14	05:23
10.000	4.1E-06	9.4E-11	2.8E-07	2.9E-14	06:43
20.000	4.4E-07	1.0E-11	3.0E-08	3.2E-15	13:27
40.000	1.7E-08	3.9E-13	1.2E-09	1.2E-16	>24:00
60.000	1.0E-09	2.3E-14	6.9E-11	7.2E-18	>24:00
80.000	1.4E-10	3.1E-15	9.3E-12	0.0E+00	>24:00

4.3 Geology and Soils Impacts

4.3.1 No-Action Alternative

The no-action alternative would have no geological and soils impact.

4.3.2 Proposed Action

The overall impact of the proposed action on site geology and soils would be temporary in nature. Soil in the central site tract would be disturbed due to removal of concrete building slabs and asphalt parking lots and excavation of contaminated soil and buried waste areas (e.g., Burial Pits). Prior to excavation work, erosion and sediment controls measures would be installed as needed, depending on the duration of the activity and specific objectives. Erosion controls serve to restrict the transport of sediment within the project area and protect nearby surface waters. Erosion and sediment control practices that would be considered for use include:

<u>Stabilization</u>

- Minimizing disturbance areas
- Minimizing and controlling dust
- Stabilizing surfaces after final grading
- Reestablishing permanent vegetative cover for disturbed areas

<u>Structural features</u>

- Barriers to isolate areas of erosion and minimize sediment transport
- Check dams in swale areas to minimize sediment transport
- Erosion control blankets to minimize erosion due to concentrated flow prior to establishing vegetation
- Construction of stabilized construction entrances to minimize the transport of sediment from project areas
- Soil stockpiles surrounded by sediment barriers, e.g., silt fencing and/or tarp covers

<u>Storm water management</u>

- Maintaining runoff flow patterns and discharge locations similar to existing conditions
- Maximizing overland flow through vegetated areas
- Active pumping, containment, and, treatment of excavation pit water prior to discharge

Soil remediation activities involving licensed material would be conducted in accordance with approved, written procedures as required by NRC License No. SNM-33. The site license does not authorize any procedures for remediation of contaminated soils without NRC approval via a specific license amendment or a decommissioning plan.

Work plans would specify the methods planned for minimization of soil disturbance and erosion. In general, standard erosion and sediment controls would be established at each work zone prior to and during soil excavation activities.

4.4 Water Resources Impacts

4.4.1 No-Action Alternative

The no-action alternative could result in the continued migration of radiological and chemical contamination into surface water and groundwater in the vicinity of the site. The Site Pond/Creek on the southwestern boundary of the central site tract (see Figures 1-4 and 2-1) contains residual radioactivity in sediment and nearby surface soil. Northeast Site Creek on the northwestern boundary of the central site tract also has potential for radioactive contamination due to the visible surface runoff and the proximity of the stream to the waste Burial Pits. Residual radioactivity has also been found in groundwater in the soil overburden in and around the central site tract. VOCs have been found in overburden and bedrock groundwater. The bedrock aquifers generally have not shown radiological contamination, with the exception of isotopic uranium activities indicated in one monitoring well screened in the Roubidoux Formation. The results from this well, which is located across State Road P north of the Hematite facility, seem inconsistent with the overall observation that uranium contamination in groundwater is limited to the immediate vicinity of known soil contamination areas (e.g., the Burial Pits, the Evaporation Ponds, and under buildings). Investigations are continuing to determine an explanation for the inconsistencies with this well.

4.4.2 Proposed Action

Potential minor impacts to water resources at the site could occur from surface water runoff that occurs during the decommissioning process. During soil remediation activities, potential run-on to areas of potentially contaminated surface soils would be diverted through the use of diversion berms or swales. Potentially contaminated runoff would be contained and treated as necessary before discharge to surface water bodies.

The Site Creek/Pond and the Northeast Site Creek potentially could require remediation to remove contamination in sediment and nearby soil. If it becomes necessary to remove contaminated sediment from an extended section of a stream bed, the stream would be temporarily diverted upstream of the contamination so that the stream section could be dried out for remediation. Stream diversion could be accomplished by installing a temporary dam to create a holding area from which the water would be pumped to a location further downstream. Diversion ditches or piping could also be used to reroute flow around a section of the stream. For small hot spots in or near the stream bed, a small dike could be used to divert the water around the hot spot to allow remediation. The selected diversion method would depend on the extent of sediment contamination in various sections of the streams. In all cases, care would be taken not to disturb the contaminated sediment before the stream is diverted. After the stream section is dry, the soil remediation process described in the DP would be followed.

Surface water remediation activities involving licensed material would be conducted in accordance with approved, written procedures as required by NRC License No. SNM-33. The site license does not authorize any procedures for remediation of contaminated surface water features without NRC approval via a specific license amendment or a decommissioning plan.

A review of FEMA flood maps and an on-site wetland survey indicated that no flood plains or wetlands are present within the ten-acre central site tract. Consequently, the implementation of the proposed action would have no impacts on these resources.

Removal of the concrete floor slabs and asphalt parking areas could have a significant local impact on the rate of rainwater infiltration and the resultant transport of soluble contaminants in groundwater away from the central site tract. This potential would be addressed in the design of soil and groundwater remediation systems and the timing of these remedial activities. For example, it might be necessary to implement soil removal activities in certain sub-slab areas immediately following slab removal. In localized areas of particular concern, diversion dikes and a containment structure could be erected over contaminated areas to minimize potential rainwater infiltration or surface water run-on.

4.5 Ecological Resources Impacts

4.5.1 No-Action Alternative

The no-action alternative could result in the continued migration of radiological and chemical contamination into soil, surface water, and groundwater in the vicinity of the site. Over the long term, this could have an adverse on ecological resources in the vicinity of the Hematite site.

4.5.2 Proposed Action

Because of the lack of desirable wildlife habitat in the central site tract, significant adverse impacts to ecological resources are not anticipated from implementation of the proposed action.

4.6 Air Quality Impacts

4.6.1 No-Action Alternative

The no-action alternative would not cause any change in emissions to the air and would not be expected to result in any change to air quality in the area.

4.6.2 Proposed Action

Emissions associated with soil remediation and resulting from construction vehicles and equipment would have a temporary and insignificant impact on the air quality of the site area. Emissions resulting from implementation of the proposed action are not anticipated to approach the emission levels observed during operation of the facility. Under certain meteorological conditions, there could be slightly higher concentrations of pollutants such as SO_2 and NO_2 and fugitive dust in the vicinity of concrete and soil handling operations, but actions would be taken to mitigate the production and spread of these pollutants.

To ensure that construction equipment emissions are controlled, equipment would be required to have the manufacturers' recommended emission control systems. To prevent the airborne spread of residual particulate matter and contamination, concrete floor slabs would be decontaminated as required prior to building demolition, and fixatives and coverings would be used as necessary to prevent loose contamination from being released from the slabs. Potential dust generation during soil excavation and backfill and during demolition of concrete pads left from building removal would be controlled by spraying the work areas with water. If necessary during concrete slab removal, foaming agents could also be applied to minimize the generation of airborne dust and contamination. In localized areas of particular concern, a containment tent could be constructed over contaminated areas with HEPA (high-efficiency particulate air) filtration to control airborne releases.

The current program for monitoring air quality would be expanded, as necessary, during decommissioning activities (See Section 6.1). This monitoring program would be in accordance with the site license and the Hematite *Radiation Protection Plan* (Ref. 35). During site decommissioning, compliance demonstration would rely on air monitoring devices located around the facility. Currently there are three such air monitors located outside the buildings. The number of these devices would be adjusted as required. Locations would be selected to provide measurement at both downwind locations that are considered to be representative of anticipated release pathways and upwind locations for background comparison. The monitoring would address particulates and gross alpha and gross beta radioactivity.

4.7 Noise Impacts

4.7.1 No-Action Alternative

The no-action alternative would have no impact on noise levels in the site area.

4.7.2 Proposed Action

Operation of equipment during decommissioning activities, such as heavy machinery, jackhammers, and air compressors, would cause temporary noise level increases. Noise levels would be mitigated by the use of proper noise attenuation controls on noisy equipment. Decommissioning activities would also be restricted to normal working hours, so that evening and nighttime noise levels would not be affected. On-site noise levels would be routinely monitored, and site workers would be provided with hearing protection as necessary.

Implementation of the proposed action is not anticipated to significantly impact existing ambient noise levels to the public. There are no hospitals or schools near enough to be impacted by noise levels from the site. There are three private residences located on the site property, and other residences are located within 1/4 mile of the site. However, noise levels during decommissioning activities are not expected to be significantly louder than the noise levels experienced when the plant was operating routinely.

4.8 Historic and Cultural Resources Impacts

4.8.1 No-Action Alternative

The no-action alternative would have no historical or cultural impacts.

4.8.2 Proposed Action

Historic and cultural resources (including prehistoric or historic sites, buildings, districts, structures, and objects) are protected under the National Historic Preservation Act (16 USC 470a-470w) (Ref. 36), Executive Order 11593—Protection and Enhancement of the Cultural Environment, the Archaeological and Historic Preservation Act (16 USC 469-469c) (Ref. 37), and the Historic Sites Act (16 USC 461-467) (Ref. 38). These regulations require that federal agencies take into account the effects of their actions (including permitting and licensing activities) on potential historic or cultural resources and, if necessary, resolve potential impact issues with appropriate state and federal agencies.

The historical significance of the Hematite site relates to the role that the facility filled during the “cold war” era. From 1956 to 1974, the Hematite facility supplied high-enriched nuclear fuel for the U.S. Navy nuclear submarine program and other reactor programs. The Hematite facility was also the first commercial nuclear fuel processing plant in the United States.

Due to the potential historical significance of the site, the National Park Service and State Historic Preservation Officer required that a Historic American Engineering Record (HAER) be compiled for the buildings on the site. The HAER (HAER file No. MO-311) (Ref. 31) process has been completed for the site, including photographic documentation of both the process equipment and buildings. The National Park Service has provided its concurrence for equipment removal and building demolition and has no further issues concerning the historical aspects of the site. The completion of the HAER adequately documents the historical resources and satisfies the requirements of Section 106 of the National Historic Preservation Act (Ref. 36).

No impacts to potential archeological resources are anticipated from soil excavation in the central site tract.

4.9 Visual/Scenic Resources Impacts

4.9.1 No-Action Alternative

The visual/scenic quality of the plant facility would remain in a degraded condition due to the exposed concrete floor slabs and asphalt parking lots, which would remain after building demolition. These conditions would be visible to passing traffic on State Road P.

4.9.2 Proposed Action

Visual impacts are determined by the degree of visual change introduced by project components, the degree to which those changes could be visible to surrounding viewers, and the general sensitivity of the viewers to landscape alterations. Visual change is determined by the amount of visual contrast that a particular project component might create (e.g., changes to form, line, color, texture, and scale in the landscape); the amount of obstruction (i.e., loss of view); and degradation of specific scenic resources (e.g., construction of a facility that blocks views of a scenic landscape).

During decommissioning activities, views of the facility would be temporarily degraded as contaminated soil and debris are excavated and shipped from the site. The degraded views would not be expected to have a significant impact, because they would have a limited timeframe.

Implementation of the proposed action would have beneficial long-term impacts to visual/scenic resources. The long-term visual character of the Hematite site would be improved by restoration of the central site tract following soil remediation.

4.10 Socioeconomic Impacts

4.10.1 No-Action Alternative

The no-action alternative would have little or no impact on the current socioeconomic conditions in the area. This alternative would prevent the site from being remediated and returned to productive use for the local economy.

4.10.2 Proposed Action

Conduct of the proposed action is not expected to adversely impact the socioeconomic environment surrounding the Hematite site. Although three residences are located on the eastern portion of the site, no residences or businesses would be displaced and/or adversely impacted by implementation of the proposed action. The decommissioning project would, however, create the opportunity for construction and equipment operator jobs, which would result in a short-term positive impact to the local socioeconomic environment. The short-term influx of additional workforce would not have a significant impact on the local infrastructure.

The proposed action would move the site closer to the ultimate goal of making the site available for productive use for the local economy. Future uses of the site could include agricultural or industrial, and either of these uses would contribute to the local economy. Therefore, site decommissioning could have a long-term positive impact to the local economy.

4.11 Environmental Justice

4.11.1 No-Action Alternative

The no-action alternative would have no disproportionate environmental impacts on low-income or minority populations in the area.

4.11.2 Proposed Action

Implementation of the proposed action is not anticipated to disproportionately impact minority or low-income populations. In addition, degradation of local air quality and significant increases in local traffic and noise are not expected to result from implementation of the proposed action or to disproportionately affect minority or low-income populations.

4.12 Public and Occupational Health Impacts

4.12.1 No-Action Alternative

The no-action alternative could result in the continued migration of radiological and chemical contamination into soil, surface water, and groundwater in the vicinity of the site. This would increase the risk of public exposure to chemical and radiological contaminants in these media.

4.12.2 Proposed Action

During site decommissioning activities, there would be increased risk of exposure to non-radiological and radiological contaminants. Potentially impacted groups include site workers, site visitors, and members of the public adjacent to waste transportation routes. The potential for adverse public and occupational health impacts would be minimized by the plans and controls that would be in place during the work.

Non-radiological Impacts

Excavation of the waste Burial Pits during soil remediation could expose site workers to hazardous chemicals. Beginning no later than 1965, and perhaps as early as 1958 or 1959, and continuing at least until November 1970, on-site burial was used as a means of disposal of contaminated materials and wastes at Hematite. From 1965 until 1971, up to 40 large, unlined pits were dug northeast of the plant buildings (Figures 1-4 and 2-1). Each pit is approximately 20 ft. by 40 ft. and 12 ft. deep. These pits were used to dispose of materials and waste generated by the plant processes. This on-site burial was a formally authorized activity, conducted pursuant to a former policy and memoranda describing the size and spacing of the pits, the thickness of the cover, and the quantity of radioactive material that could be buried in each pit.

Based on historical logbook entries, a wide variety of wastes were buried in the waste Burial Pits. According to logbook entries, the primary waste types disposed of on site included various solids such as trash, empty bottles, floor tile, rags, drums, bottles, glass wool, lab glassware, acid insolubles, and filters. Chemical wastes were also disposed of in the pits, including hydrochloric acid, hydrofluoric acid, potassium hydroxide, TCE, PCE, alcohols, oils, and wastewater.

Asbestos or hazardous waste materials (e.g., lead pipe gaskets) could potentially be encountered during removal of below-grade utilities remaining from building demolition. Occupational safety and health issues associated with asbestos and hazardous waste handling and removal are subject to OSHA regulations at 29 CFR 1910 and 1926 (Ref. 39 and 40). EPA regulations govern the handling of asbestos-containing materials [40 CFR 61, Subpart M (Ref. 41)], and the generation, storage, and transportation of hazardous waste is subject to the EPA regulations outlined in 40 CFR 260 through 272 of RCRA (Ref. 42).

Radiological Impacts

As discussed in Section 3.11, there are radiological contaminants in the soil that present potential occupational and public health risks during the site decommissioning. As noted in Section 2.1.2, dust would be generated during soil excavation and backfill and during demolition of concrete pads left from building removal. This would be mitigated by spraying the work areas with water to control airborne dust and contamination. If necessary for concrete demolition, a containment tent could be constructed over localized contaminated areas of particular concern, with HEPA filtration to control airborne contamination.

External radiological exposure hazards are insignificant, because of the low concentrations of radioactive contaminants at the site and the absence of strong gamma emitters. Internal exposure, by inhalation, ingestion, or injection through open wounds, is the primary hazard associated with these contaminants.

Using effective engineering and administrative controls, dust controls, respiratory protection (as applicable), and protective clothing measures would ensure radiation exposures due to inhalation and ingestion of airborne radioactive contamination are maintained below the respective administrative limits. Work involving ionizing radiation would be performed in compliance with the site's *Radiation Protection Plan* and other applicable health physics procedures. The guiding philosophy would be to keep exposures as low as reasonably achievable (ALARA).

For purposes of calculating the bounding estimate of radiation exposure to the neighboring public, the source term shown in Table 4-5 was used.

Table 4-5 Source Term for Soil Remediation Activities

Nuclide	Activity Distribution (%)	Mass Concentration (pCi/g)
U-234	88.7%	1,758
U-235	4.7%	93
U-238	6.6%	132
Total	100%	1,983

These concentrations are based on the anticipated average concentrations for the material in the Burial Pits, which would conservatively bound the concentration of these nuclides in other soils. A mass concentration in air that would represent heavy dust conditions would be 15 mg/m^3. Using Equation 1 and Figures 1 and 2 of Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," (Ref. 43) the downwind concentrations of radioactive material from the soil remediation activities can be calculated. The calculations were based on a breathing rate of 8.4 x 10^3 m^3/yr and the dose conversion factors given in Table 2.1 of Federal Guidance Report No.11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion" (Ref. 44) The results are presented in Figure 4-1.

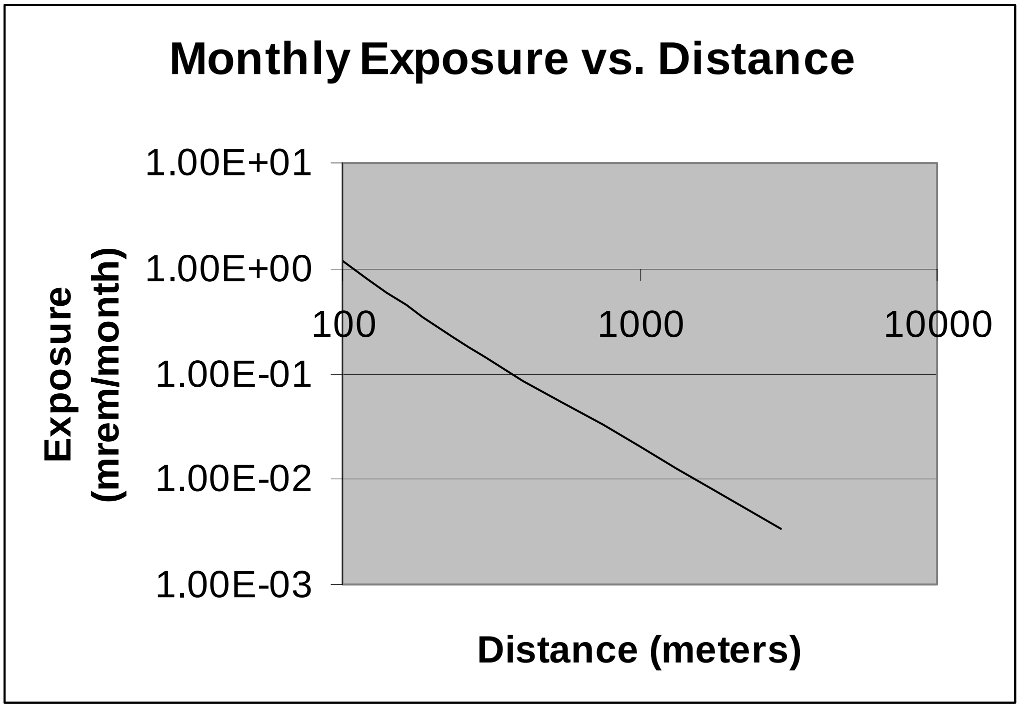

Figure 4-1 Monthly Dose vs. Downwind Distance Due to Soil Remediation

The nearest resident is located approximately 300 meters from the Hematite site, and the bounding estimate for the resulting radiation exposure due to soil remediation activities is 0.15 mrem/month using a 40 hr/wk and 4.5 weeks/month as the exposure duration. This low radiation exposure estimate is a conservative bounding estimate for a number of reasons. Examples of the conservatism include the assumptions that no actions are taken to limit heavy dust conditions, that the exposed individual remains outdoors for the entire period of remediation, that the wind blows continuously in one direction for the entire period, and that there are no obstructions between the soil remediation location and the residential location. Thus it is clear that the radiation exposure to nearby residents due to soil remediation activities will be a small fraction of regulatory limits.

As noted in Section 4.3.2, disturbing the soil also increases the potential to spread contamination to nearby soil areas and streams due to storm water run-off. The soil areas to be excavated would be isolated from potential storm water run-on and run-off using such measures as berms and diversion structures/ditches. Erosion and sediment controls described in Section 4.3.2 would be used to prevent the spread of contamination.

Excavation of the Burial Pits might encounter radioactive waste that also exhibits the characteristic of a hazardous waste under EPA Resource Conservation and Recovery Act (RCRA) and corresponding MDNR regulations. If present , the mixed waste is expected to be radiologically impacted material containing chlorinated VOCs or, to a lesser degree, inorganic acids. Westinghouse plans to manage these materials in accordance with NRC and applicable EPA and MDNR hazardous waste regulations to protect public health and safety and the environment. In general, the approach would be to treat mixed waste on site as needed to remove the hazardous waste characteristic and then dispose of the residual radiological waste off site at licensed facilities.

The waste Burial Pits are also known to contain quantities of enriched uranium that require evaluations of nuclear criticality safety. Based on available records, it is estimated that the average concentration of fissile material in the pits is about 1/10 of the definition of fissile exempt materials in the transportation regulations. It is anticipated that, during any excavation of materials from the pits, specific items could be identified that have higher U-235 concentrations. However, such items would be limited in mass because the total uranium quantity in each pit was limited to approximately 800 grams of uranium at any enrichment. Operational surveys would be conducted during any excavation operations to identify discrete items and soil volumes that have high U-235 concentrations. Guidance would be developed and incorporated into site procedures based on the instruments used to identify materials that exceed a conservative fraction of the definition of fissile exempt material. Provisions would be established for handling such materials to ensure nuclear criticality safety.

Site characterization studies, including the RI results (Ref. 20 and Ref. 45) and a gamma walkover survey (Ref. 46), have identified specific locations inside the central site tract where radioactive contamination is concentrated. Soil sampling has identified residual radioactivity in all of these locations. The locations are shown in Figure 4-2 and are listed as follows:

- Burial Pits — The Burial Pits are described in this section under "Non-radiological Impacts."
- Former Evaporation Ponds — The two Evaporation Ponds consist of a primary pond and a larger secondary/overflow pond. The ponds were primarily used for the disposal of low-level liquid wastes containing insoluble uranium bearing precipitates and other solids.
- Site Pond/Site Creek Area — These surface water features are described in Sections 3.4.1 and 4.4. Sediments in this stream and pond contain residual radioactivity.

- Former Leach Field — The former Leach Field and septic system were used until 1977 when a water treatment plant was built and placed into service. Located west of the water treatment plant and Evaporation Ponds, the leach field and septic system might have been used for sanitary waste and liquid waste from the operation and maintenance of the facility.
- Soil Around and Underneath Process Buildings — The layout of the process buildings is shown in Figure 1-4. Soil under and around the process buildings has been contaminated over the years due to spills and process operations.
- Limestone Storage and Fill Areas — The Hematite plant used crushed limestone rock chips in dry scrubbers as part of the fuel processing operations. The limestone chips were partially converted to calcium fluoride in the scrubbers, and the waste limestone chips are referred to as "spent limestone." Some of the spent limestone was stockpiled on site and some was used as approved fill.
- Red Room Roof Burial Area — The old roof of the Red Room (Building 240 in Figure 1-4) was buried in an area south of the Tile Barn (Building 101).
- Deul's Mountain — During the construction of the Building 256 warehouse, a large area of potentially contaminated soil was removed and stored along the southeast corner of the fence line. This pile was known as "Deul's Mountain." This soil pile is being removed and shipped off site for disposal.
- Cistern Burn Pit — The Cistern Burn Pit located south of the Tile Barn (Building 101) was used historically to burn contaminated wood and pallets.

Some soil samples collected in a grid pattern across the central site tract and at other locations identified by the gamma walkover survey also contained elevated levels of residual radioactivity.

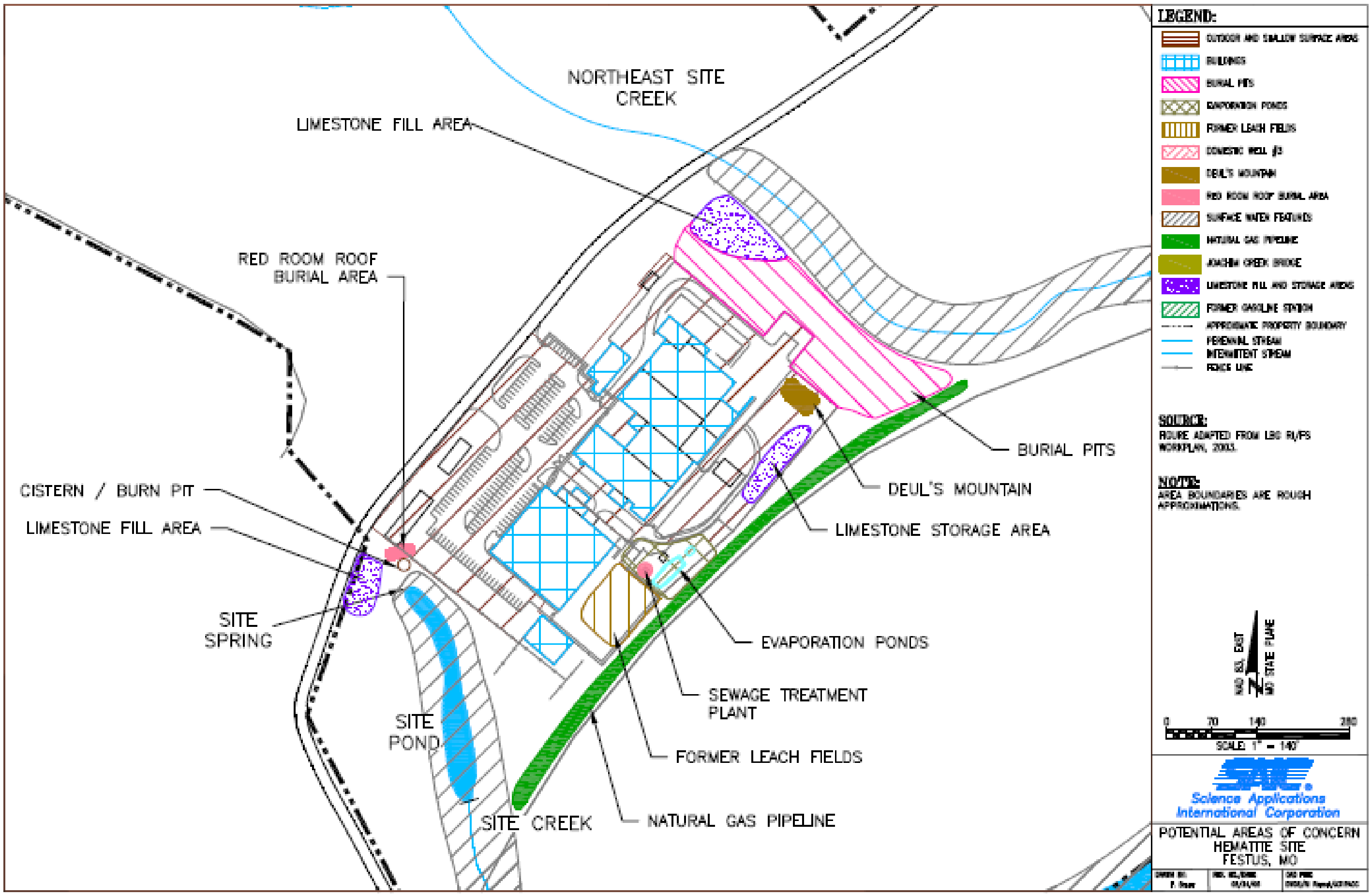

Figure 4-2 Contaminated Soil Areas

4.13 Waste Management Impacts

4.13.1 No-Action Alternative

The no-action alternative would have no waste management impacts. This assumes that no contaminated or hazardous waste would be generated under the no-action alternative.

4.13.2 Proposed Action

Implementation of the proposed action would result in a short-term negative impact through the creation of soil and debris wastes. The waste streams anticipated to be generated during decommissioning activities could include, but would not be limited to, RCRA or Toxic Substances Control Act (TSCA) (Ref. 47) wastes, low-level radioactive waste (LLRW), mixed waste, sanitary waste, and demolition and construction debris.

An active commitment would be made to minimize the amount of radioactive and hazardous waste generated during the decommissioning activities. Materials that have not been exposed to hazardous constituents would be removed or protected to avoid cross contamination or co-mingling. Waste minimization techniques could include taking only tools needed into a contaminated area, re-using tools, decontaminating and free releasing, and providing a containment toolbox that could be moved to different radiological areas as needed.

Co-mingling would be strictly prohibited and controlled through containerization and segregation. Co-mingling would be prevented to the extent possible through the use of tarps, discrete barriers, and containerization. Staging areas would be established to control waste packages that are ready for transportation and disposal.

Metal items removed during soil remediation, such as below-grade piping, would be surveyed for radioactive contamination and disposed of accordingly. Concrete and asphalt slabs would be broken to manageable size pieces and appropriately disposed. Demolition debris would be sized as necessary, containerized, characterized, and disposed.

The waste streams generated as a result of the decommissioning effort would be characterized by sampling and analysis to establish profile, packaging, and disposal criteria. Characterization might encompass a combination of process knowledge, radiological survey, volumetric sampling, and direct sampling. Direct sampling could be performed utilizing direct radiological and hazardous constituent reading instruments to survey the material before and after removal. Characterization data would provide information to support health and safety operations, as well as waste packaging and transportation requirements. The sampling protocol would be adequate to meet the waste acceptance criteria (WAC) of the approved disposal facility.

Based on characterization data, waste would be segregated and analyzed as required by the disposal facility's WAC. If analyses show an out-of-compliance result, an alternate disposal facility would be used. Each waste stream is unique and would require specific handling, containerization, labeling, transportation, and disposal procedures. The waste streams that could be generated as a result of the decommissioning efforts are listed as follows:

Sanitary Waste

Sanitary waste (office trash) would be containerized in roll-offs or sanitary dumpsters and transported to a sanitary landfill for disposal. This waste stream would be disposed of in accordance with the facility requirements and would not contain hazardous constituents that cannot be accepted at a sanitary landfill.

Clean Debris

Debris that is released and free of hazardous contamination is defined as clean debris. Clean debris might include such material as brick, concrete, asphalt, paper, wood, glass, metal, plastics, mineral material, soil, wire, and pipe. Clean debris would be characterized, certified to meet radiological free-release criteria for radiological and hazardous contamination, containerized, transported, and disposed at a permitted facility.

LLRW Asbestos-Containing Material

Asbestos-containing material (ACM) found to be contaminated with radiological constituents would be handled as radioactive waste. The LLRW ACM would be double wrapped, labeled with both ASBESTOS and RADIOLOGICAL warnings in accordance with regulatory guidance, containerized, transported, and disposed at a permitted facility. LLRW ACM that is bagged would be stored/staged in the appropriate container, depending on the volume of waste. Metal boxes and drums could be utilized for small volumes, while roll-offs or intermodal containers could be utilized for large volumes.

LLRW Solids

Soil remediation would generate three general categories of solid LLRW: soil, demolition debris, and Burial Pit material. Soil might also include spent limestone that was used as on-site landfill. Demolition debris would consist mostly of concrete floor slabs and foundations, asphalt pavement, and below-grade utilities (piping and conduit). Burial Pit material could include a wide variety of waste materials.

Soil would be volumetrically contaminated. It is anticipated that floor slabs and foundations, piping, foundation material, and other non-soil materials would exhibit surface contamination only. Burial pit material might contain volumetric or surface contamination.

Debris that is radiologically contaminated above the WAC for volumetric release as construction debris would be disposed of as LLRW. Solid LLRW would be sized, characterized, containerized, transported, and disposed at a permitted disposal facility as described in the waste profile. Solid LLRW would be stored/staged in the appropriate container.

LLRW Liquids

Soil remediation operations could result in the generation of LLRW liquids from contaminated groundwater removed to facilitate soil excavations and contaminated storm water from active remediation areas. Wastewater from vehicle and equipment decontamination areas might also contain contaminated soil particles.

Depending on the volume generated, aqueous-based LLRW liquids would be treated on-site and discharged under an amended NPDES permit or containerized for off-site disposal. LLRW liquids destined for off-site disposal would be sampled, characterized, containerized, labeled, transported, and disposed at a permitted disposal or process facility. LLRW liquids would be stored/staged in the appropriate container, depending on the volume and type of waste. The containers would be filled so that the weight does not exceed the maximum weight specified by the manufacturer.

Polychlorinated Biphenyl Waste

Polychlorinated biphenyl (PCB) waste, if any, would be containerized, labeled, transported, and disposed at a permitted disposal facility. PCB waste would be stored/staged in the appropriate container depending on the volume and type of waste.

Hazardous Waste

Hazardous waste would be identified via process knowledge as well as characterization and volumetric sampling. Analytical data would delineate the specific hazardous material and the levels of contamination. Identified hazardous wastes would be segregated and containerized.

Hazardous waste that is not radiologically impacted would be managed in accordance with applicable EPA and MDNR hazardous waste regulations to protect public health and safety and the environment. In general, the approach would be to dispose of hazardous waste at a permitted Treatment, Storage, and Disposal Facility (TSDF). In the event the material exceeds the Land Disposal Restrictions (LDRs) set forth by the EPA or the MDNR, the material would be treated at a permitted TSDF prior to disposal at a permitted TSDF.

Mixed Waste

Mixed waste meets the EPA definition of a hazardous waste and is also radiologically contaminated. Mixed waste would be identified via characterization and volumetric sampling. Analytical data would delineate the specific hazardous material, the levels of contamination, and the radioactive isotopes.

Mixed waste would be managed in accordance with NRC and applicable EPA and MDNR hazardous waste regulations to protect public health and safety and the environment. In general, the approach would be to treat hazardous waste on site as needed to remove the hazardous waste characteristic and then dispose of the residual waste off site at licensed facilities. Mixed wastes (LLRW/RCRA or LLRW/TSCA) would be managed in an area that meets the requirements of a LLRW staging area and SAA or LLRW staging area/PCB storage area according to waste characterization. Mixed waste would be stored/staged in the appropriate container depending on the volume and type of waste.

Investigation Derived Waste

Investigation Derived Waste (IDW) would be handled, containerized, labeled, and dispositioned in accordance with the Hematite site *IDW Management Plan* (Ref. 48).

5.0 MITIGATION MEASURES

This section provides a summary of mitigation measures that have been mentioned throughout this ER. Decommissioning activities would be conducted in a manner that protects the environment and the health and safety of the public and employees. Mitigation measures would be implemented to offset any potential adverse impacts associated with the proposed action. The primary mitigation measures that would be used include the following:

Erosion and Sediment Control

Prior to implementation of the proposed action, an engineering evaluation would be performed to develop a storm water management plan. The storm water management plan would include both procedural and engineering controls to reduce storm water run-on to work area, quantities of potentially contaminated storm water runoff, and total suspended solids (TSS) and radiological contamination levels in surface water runoff. In addition, best management practices would be utilized to prevent erosion and sedimentation into adjacent creeks and tributaries. Effluent would be monitored through the normal outfalls per the site NPDES permit. Structural features such as use of barriers, dams, erosion control blankets, sediment barriers, silt fence, or straw bales would be evaluated for use to minimize sediment migration. Storm sewers and grates would be covered during demolition, as necessary, to prevent the migration of waterborne contamination.

Air Quality Control

Potential adverse impacts to air quality would be mitigated with both procedural and engineering controls. When necessary, engineering controls such as water spray would be used to minimize airborne dust and airborne activity generation. Fixatives and coverings would also be used as necessary to prevent loose contamination from being released during demolition of concrete slabs. If necessary during concrete slab removal, foaming agents could also be applied to minimize the generation of airborne dust and contamination. In localized areas of particular concern, a containment tent could be constructed over contaminated areas with HEPA (high-efficiency particulate air) filtration to control airborne releases.

Perimeter air monitoring would be used to document levels of airborne particulates and radioactive contaminants during decommissioning activities.

Noise Level Control

Activities that generate excessive noise would be identified and monitored. Contractors would be required to ensure that noisy equipment retains the original manufacturer's noise attenuation controls. Decommissioning activities would also be restricted to normal working hours, so that evening and nighttime noise levels would not be affected. Workers would be protected through work planning and scheduling and the use of personal protective equipment.

Public and Occupational Health Controls

The Hematite *Health and Safety Plan* (Ref. 49) would be used to establish safe work practices for site workers. The *Radiation Protection Plan* would be used to establish safe practices and operations involving ionizing radiation and ensure compliance with the requirements of the NRC. Radiation Work Permits would be used to control work and ensure that workers observe the proper precautions in areas where hazards exist due to radiation, contamination, or airborne radioactivity. The *Health and Safety Plan* and *Radiation Protection Plan* also establish practices to protect the public and the immediate environment from hazards posed by the decommissioning activities.

Contamination Control

Contaminated and non-contaminated debris, wastes, liquids and solids would be properly characterized and stored/staged in approved containers. Radioactive waste management would be performed in accordance with Hematite's *Waste Management and Transportation Plan* (Ref. 50). Radioactive waste shipments would be made in accordance with procedural controls and DOT and NRC regulations. To the extent practical, the number of waste packages and waste shipments would be minimized.

Nuclear Criticality Protection

As described in Section 4.12.2, the waste Burial Pits are known to contain quantities of enriched uranium that require evaluations of nuclear criticality safety. Operational surveys would be conducted during excavation operations to identify discrete items and soil volumes that have high U-235 concentrations. Guidance would be developed and incorporated into site procedures for handling such materials to ensure nuclear criticality safety.

6.0 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

6.1 Radiological Monitoring

Westinghouse has committed to conduct the decommissioning activities in a manner that protects the health and safety of the public, site workers, and the environment. This commitment includes the development of programs and procedures that provide for monitoring, detection, and control of potential releases of radioactive material to the environment.

The site radiological environmental monitoring program is conducted in accordance with License No. SNM-33 and Hematite's *Radiation Protection Plan*. Activities related to environmental monitoring and control comply with the *Hematite Quality Assurance Program Plan* (Ref. 51). The license commitment for environmental monitoring and control serves as a minimum commitment. As decommissioning activities progress, the monitoring program would be revised as necessary to ensure adequate environmental monitoring and controls are always in place. Some of the methods that would be used to determine if monitoring program changes are necessary include:

- Procedure revisions would be reviewed by the decommissioning staff to identify environmental impacts that might require changes to monitoring and/or controls.
- Readiness reviews for decommissioning activities would include consideration of environmental impacts and associated monitoring requirements.
- The Project Oversight Committee, which provides management oversight and review of decommissioning activities, would also consider the need for environmental monitoring changes during its review process.

Environmental samples would be collected and analyzed as shown in Table 6-1. Sample frequency could vary due to inclement weather, operating conditions, or a variance in decommissioning activities. More frequent or additional samples could be taken as required for special studies and evaluations. Should a significant continuous upward trend be noted in any of the sampling data, actions would be taken to investigate the cause and remedial actions would be taken as appropriate.

Table 6-1 Radiological Environmental Monitoring Program

Sample Media	Sampling Points	Collection Frequency	Analysis Frequency	Sample Type	Analysis Type
Air Effluents	On-site remote samplers	Continuous	Daily–during soil remediation work Weekly–during non-work periods	Particulate	Daily/weekly–gross alpha, gross beta Monthly–composite analyzed for isotopic U, gamma spec, and Tc-99
	On-site high-volume samplers	Daily–during soil remediation work	Daily–during soil remediation work	Grab Particulate	Daily–gross alpha, gross beta Monthly–composite analyzed for isotopic U, gamma spec, and Tc-99
Liquid Effluents	Sewage treatment Outfall 001	Weekly	Weekly	Grab	As described in Section 3.4.1, Table 3-2
	Site Creek dam Outfall 002	Continuous	Weekly	Composite	As described in Section 3.4.1, Tables 3-2 & 3-3
	Storm drain Outfall 003	Monthly	Monthly	Grab	As described in Section 3.4.1, Table 3-2
Surface Water	Joachim Creek above and below confluence with Site Creek	Monthly	Monthly	Grab	Gross alpha, gross beta
	Joachim Creek & Site Creek confluence	Quarterly	Quarterly	Grab	Gross alpha, gross beta
	Joachim Creek & Northeast Site Creek confluence	Quarterly	Quarterly	Grab	Gross alpha, gross beta
	Site Outfalls 004, 005, and 006	Weekly	Weekly	Grab	As described in Section 3.4.1, Table 3-2
Groundwater	Off-site well (Hematite)	Quarterly	Quarterly	Grab	Gross alpha, gross beta
	Evaporation Ponds monitoring wells (3)	Quarterly	Quarterly	Grab	Gross alpha, gross beta
	South Vault sample well	Quarterly	Quarterly	Grab	Gross alpha, gross beta
	Burial Pits monitoring wells (3)	Quarterly	Quarterly	Grab	Gross alpha, gross beta
	Perimeter wells	Quarterly	Quarterly	Grab	Gross alpha, gross beta
Soils	Four locations surrounding plant	Quarterly	Quarterly	Grab	Gross alpha, gross beta

Sample Media	Sampling Points	Collection Frequency	Analysis Frequency	Sample Type	Analysis Type
Vegetation	Four locations surrounding plant	Quarterly	Quarterly	Grab	Gross alpha, gross beta
Sediment	Site Creek below Site Creek dam	Annual	Annual	Grab	Gross alpha, gross beta
	Northeast Site Creek near railroad crossing	Annual	Annual	Grab	Gross alpha, gross beta

As described in Section 3.4.1, Hematite conducts liquid effluent monitoring under the NPDES. Monitoring parameters are listed in the permit and include biological, chemical, and radiological constituents. Radiological results are reported to the State of Missouri on a semiannual basis. Analysis results approaching or exceeding limits would result in the associated work activity being modified or stopped until appropriate evaluations and corrective actions can be completed.

Liquid effluent samples are also collected at or prior to discharge from the waste handling system. This sampling is via representative grab samples of batch discharges or by sampling of continuous discharges or both. One or more of the following sample analysis methods would be used:

- Alpha activity measurements
- Uranium fluorimetry
- Kinetic phosphorescence analyzer (KPA)
- Mass spectroscopy
- Beta activity measurements
- Gamma spectroscopy
- Neutron activation analysis

Other approved analytical methods for sample analysis can be authorized by the RSO.

During decommissioning activities, air quality would be monitored for radiological contaminants and particulates as determined by the RSO. The sampling program would be designed based on the potential that the effluent from an area has for contributing to the dose to a member of the general public. Environmental area samplers would be placed at locations that represent the predominant downwind locations from remediation activities. The selected locations would confirm the absence of contaminants based on the differences between upwind and downwind samples. Moderate-volume samplers would be used to collect samples through filters. Samples would be taken daily and analyzed for gross alpha and gross beta radioactivity and for total suspended particulate concentrations through a gravimetric determination. Airborne effluent monitoring systems, when used, would be calibrated at intervals not to exceed 12 months.

Continuous aerosol monitors would be used to provide real-time data near the work areas associated with soil remediation, material handling, and container loading. Locations of the monitors would be determined prior to the start of daily activities based on wind direction. Locations would be adjusted upon significant changes in wind direction. Wind direction would be determined by a wind sock or equivalent device. Monitors would be setup with size selective inlets to determine the concentration of airborne particulate matter with an aerodynamic diameter of 10 microns (PM_{10}). The monitors would be set to alarm upon exceeding a pre-set PM_{10} concentration limit selected to protect workers and ensure airborne PM_{10} concentrations at the property boundary are well below regulatory limits. If an alarm level is exceeded, associated activities would be stopped and actions would be taken to improve emission controls or reduce the production of emissions until local levels fall below the alarm level.

Additionally, job coverage would performed by HP technicians. Radiation surveys would be performed during remediation, handling, and loading activities to ensure radiation protection limits are not exceeded. If those limits are approached or exceeded, the associated work activity would be modified or stopped until appropriate evaluations and corrective actions can be completed.

The control limits for alpha and beta activity in liquid effluents are 3.0×10^{-7} µCi/ml average for alpha and 5.0×10^{-6} µCi/ml average for beta. The stated control limits for alpha and beta activity would apply at the site boundary and are average values for the year. If the control limits are exceeded, averaged over a calendar quarter, an investigation would be conducted and corrective action taken.

Gross-alpha and gross-beta analyses are performed on liquid effluent samples. Gross-alpha analysis is performed on air effluent samples. The average concentrations for 2003 are shown in Table 6-2:

Table 6-2 Average Effluents for 2003

Effluent	Gross Alpha	Gross Beta	10 CFR 20 App. B Limit
Liquid	1.52E-8 µCi/ml	2.07E-8 µCi/ml	3.00E-7 µCi/ml (alpha) 5.00E-6 µCi/ml (beta)
Air (stacks)	2.27E-15 µCi/ml	N/A	6.00E-14 µCi/ml (alpha)

Effluent samples are collected in accordance with approved site procedures. Analyses of effluent samples are performed by a contract laboratory selected from the approved vendors list. Analyses of physical and chemical characteristics of radionuclides in effluents have not been performed. Air samples are analyzed for particulates. Water samples are analyzed for filtered and unfiltered fractions.

6.2 Physiochemical Monitoring

Current and proposed chemical monitoring at facility outfalls is described in Tables 3-1 and 3-2, respectively, in Section 3.4.1.

6.3 Ecological Monitoring

As part of the site evaluations being conducted under the NCP, Westinghouse is performing a screening-level ecological risk assessment. As part of that process, Westinghouse will, in consultation with responsible federal and state agencies, identify ecological resources associated with the site and the potential impacts to these resources.

7.0 COST BENEFIT ANALYSIS

7.1 No-action Alternative

Although there would be some facility maintenance and security costs for the no-action alternative, these costs are not estimated because the no-action alternative does not achieve the long-term objectives for the site. The no-action alternative offers some potential benefits, such as, significantly reduced costs, no disturbance of site soils and streams, and no short-term increase in site noise and traffic levels. These minimal benefits do not compare with the long-term adverse effects of continued migration of chemical and radiological contaminants from the site into the surrounding environment.

7.2 Proposed Action

Major long-term benefits from the proposed action would include the following:

- Removal of radiological and hazardous chemical source terms that result in the continual migration of contaminants into surrounding soil, surface water, and groundwater
- Reduction of hazardous chemical and radiological contamination in site soil, surface water, and groundwater to acceptable levels
- Safe off-site disposal of waste materials from the site
- Improved visual and environmental conditions on the site
- Potential economic use of site land
- Public confidence that the site is no longer a potential health or environmental risk

8.0 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Based on a review of the issues discussed in this document, implementation of the proposed action is not anticipated to cause significant adverse environmental or socioeconomic impacts to the communities surrounding the Hematite site. As discussed in Section 4.0, all of the long-term impacts of the proposed action are expected to be beneficial. A summary of expected short-term and long-term impacts for each of the resources is presented in Table 8-1.

Table 8-1 Summary of Proposed Action Impacts

Item	Short-term Impact	Long-term Impact
Land use	• Site land use would be restricted to decommissioning activities • None for surrounding land areas	• Potential economic use of site land
Transportation	• Increased traffic from waste transport • Potential public exposure to hazardous waste if there are transportation accidents	• None
Geology and soils	• Increased potential for soil erosion and contamination transport from central site tract to the remainder of the property and neighboring properties	• Site stabilization with soil erosion and sedimentation controls installed during site restoration
Water resources	• Increased potential for surface water runoff to carry contaminated sediments from central site tract into nearby streams • Diversion of streams bordering the central site tract might be required to remove contaminated sediments	• Reduction of contamination in stream and pond sediments to acceptable levels as a result of stream remediation and removal of source terms in central site tract soil • Reduction of hazardous chemical and radiological contamination in groundwater to acceptable levels as a result of removal of source terms in central site tract soil
Ecological resources	• Interruption of potential ground habitats in the central site tract during soil remediation • Interruption of stream habitats bordering the central site tract if streams are diverted for sediment remediation	• Improved habitats resulting from soil and stream remediation and removal of source terms in the central site tract

Item	Short-term Impact	Long-term Impact
Air quality	• Increased potential for dust, radioactive contamination, and VOC emission during soil excavation and concrete demolition • Slightly higher emissions resulting from use of construction vehicles and equipment	• Reduced potential for airborne radioactivity as a result of reduced surface soil contamination levels in the central site tract
Noise	• Increased on-site noise levels due to use of construction vehicles and equipment	• None
Historical and cultural resources	• None	• None
Visual/Scenic resources	• Temporary degraded view of the central site tract due to soil excavation and heavy equipment use	• Improved central site tract landscape and better views of the Joachim Creek floodplain for passing motorists
Socioeconomic	• Increase in construction and equipment operator jobs for the local area	• Potential contribution to the local economy resulting from future site use
Environmental justice	• None	• None

Item	Short-term Impact	Long-term Impact
Public and Occupational Health	• Increased risk of worker exposure to hazardous chemicals or mixed waste during Burial Pit excavation • Increased risk of worker internal radiation exposure due to airborne contamination during soil remediation activities • Increased risk of worker external radiation exposure from waste handling and Burial Pit excavation • Increased risk of worker accidents involving heavy equipment use and deep excavations • Radiation dose to even the critical member of the public is well below regulatory limits during remediation activities	• Elimination of the risk of exposure to hazardous materials at the site • Elimination or significant reduction of contaminant migration into the nearby environment and the attendant risk of public exposure • Reduction of radiological dose at the site to acceptable levels from all pathways
Waste Management	• Increased risk of worker exposure to hazardous chemicals or radiological contamination during waste handling	• Removal and safe off-site disposal of waste materials from the site

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